

VESICANT TREATMENT WITH PHENYL-THIOPHENE TYPE VITAMIN D RECEPTOR MODULATORS

CROSS REFERENCE TO RELATED APPLICATIONS

5 This patent application claims the benefit of priority under Title 35 United States Code, section 119(e), of Provisional Patent Application No. 60/439,575 filed January 10, 2003; the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

10 Chemical vesicants are typified by bis(2-chloroethyl) sulfide (Chemical Agent Symbol HD), $\text{Cl}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{Cl}$, a compound that forms blisters by either liquid or vapor contact with the skin. Related sulfur analogues of Agent HD are 1,2-bis(2-chloroethylthio)ethane (Chemical Agent Symbol Q), $\text{Cl}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{Cl}$; and bis(2-chloroethylthioethyl) ether, (Chemical Agent Symbol T)

15 $\text{Cl}(\text{CH}_2)_2\text{S}(\text{CH}_2)\text{O}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{Cl}$. Nitrogen analogues of the sulfur mustard are also vesicants and have the general formula $\text{RN}(\text{CH}_2\text{CH}_2\text{Cl})_2$. Exemplary nitrogen mustards are tris(2-chloroethyl) amine (Chemical Agent Symbol HN3), $\text{N}(\text{CH}_2\text{CH}_2\text{Cl})_3$; N-methyl-2,2'-dichlorodiethylamine (Chemical Agent Symbol NH2); and 2,2'-dichlorotriethylamine, $\text{CH}_3\text{CH}_2\text{N}(\text{CH}_2\text{CH}_2\text{Cl})_2$ (Chemical Agent Symbol NH1).

20 The activity $1\alpha,25$ -dihydroxyvitamin D3 in various systems suggests a wide range of clinical applications. Recently, chemical modifications of $1\alpha,25(\text{OH})_2\text{D}_3$ have yielded analogs with attenuated calcium mobilization effects (R. Bouillon et. al., Endocrine Rev. 1995, 16, 200-257). One such analog, Dovonex ® pharmaceutical agent (product of Bristol-Meyers Squibb Co.), is currently used in Europe and the United States as a topical

25 treatment for mild to moderate psoriasis (K. Kragballe et. al., Br. J. Dermatol. 1988, 119, 223-230).

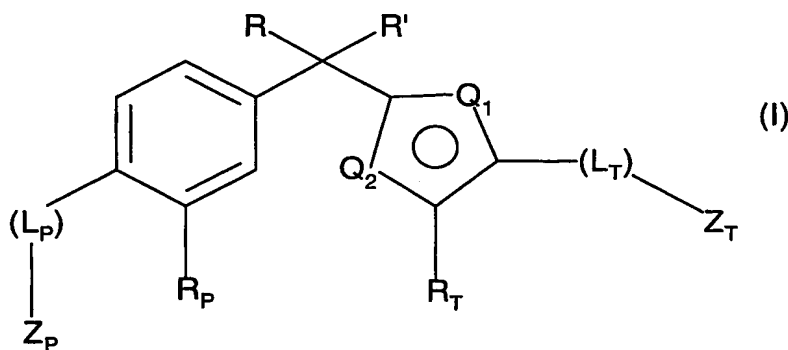
Other Vitamin D₃ mimics have been described in the publication, Vitamin D Analogs: Mechanism of Action of Therapeutic Applications, by Nagpal, S.; Lu, J.; Boehm, M. F., Curr. Med. Chem. 2001, 8, 1661-1679.

Synthetic VDR ligands have been synthesized. For example, a class of bis-phenyl compounds stated to mimic 1 α , 25-dihydroxyvitamin D₃ is described in US Patent No. 6,218,430 and the article; "Novel nonsecosteroidal vitamin D mimics exert VDR-modulating activities with less calcium mobilization than 1 α , 25-Dihydroxyvitamin D₃" by Marcus F. Boehm, et. al., Chemistry & Biology 1999, Vol 6, No. 5, pgs. 265-275.

Synthetic VDR ligands having an aryl-thiophene nucleus are described in United States provisional patent application SN 60/384151, filed 29 May 2002. Although 1- α , 25-Dihydroxyvitamin D₃ has been suggested for treatment of sulfur mustard vesicants, there remains a need for more effective agents for treatment and protection of skin cells from the adverse effects of vesicants.

SUMMARY OF THE INVENTION

Treatment and prevention of human skin cell damage by Mustard is done by contacting the skin cells with a pharmaceutically effective amount a compound represented by formula (I)



wherein the variables R, R', Q₁, Q₂, R_p, R_T, L_T, L_p, Z_T, and Z_p are as hereinafter defined. The inventors have discovered that compounds described herein display the desirable cell differentiation and antiproliferative effects of 1,25(OH)₂D₃ with reduced calcium mobilization (calcemic) effects.

In another aspect, the compounds of Formula (I) are contacted with cutaneous

lesions to ameliorate or eliminate the effects of vesicants, particularly Mustard.

In another aspect, the compounds of Formula (I) are applied to tissues to promote wound healing from trauma initiated by toxic chemicals such as Mustard.

In another aspect, all of the preceding treatments are accomplished with reduced hypercalciurea and hypercalcemia.

In another aspect, the compounds of Formula I are used for the manufacture of a medicament for preventing or alleviating the effect of Mustard.

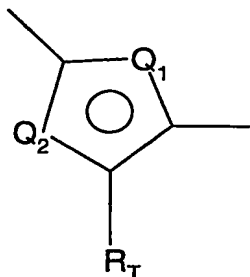
10 DETAILED DESCRIPTION OF THE INVENTION

I. Definitions:

In accordance with the present invention and as used herein, the following terms are defined to have the following meanings, unless explicitly stated otherwise:

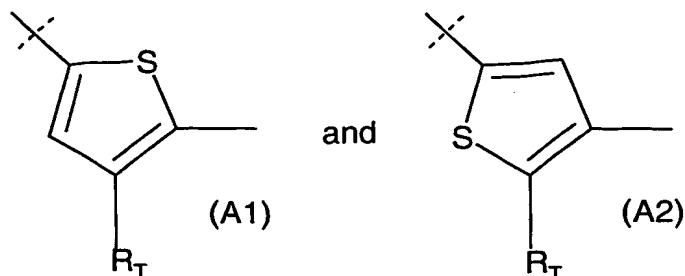
The term, "Mustard" is inclusive of both sulfur mustards and nitrogen mustard
 15 vesicants, either alone or in any combination. Exemplary of such compounds are the vesicants; bis(2-chloroethyl) sulfide (Chemical Agent Symbol HD), $\text{Cl}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{Cl}$ 1,2-bis(2-chloroethylthio)ethane (Chemical Agent Symbol Q), $\text{Cl}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{Cl}$; bis(2-chloroethylthioethyl) ether, $\text{Cl}(\text{CH}_2)_2\text{S}(\text{CH}_2)\text{O}(\text{CH}_2)_2\text{S}(\text{CH}_2)_2\text{Cl}$ (Chemical Agent Symbol T); tris(2-chloroethyl)
 20 amine (Chemical Agent Symbol HN3) $\text{N}(\text{CH}_2\text{CH}_2\text{Cl})_3$; N-methyl-2,2'-dichlorodiethylamine (Chemical Agent Symbol NH2); and 2,2'-dichlorotriethylamine, $\text{CH}_3\text{CH}_2\text{N}(\text{CH}_2\text{CH}_2\text{Cl})_2$ (Chemical Agent Symbol NH1).

The structural formula:



25 is a substructure of Formula I and represents alternative thiophene substructures, namely;

-4-



dependent on whether Q1 is sulfur when Q2 is carbon (A1) or Q1 is carbon when Q2 is sulfur (A2).

The term "alkenyl" refers to aliphatic groups wherein the point of attachment is a carbon-carbon double bond, for example vinyl, 1-propenyl, and 1-cyclohexenyl. Alkenyl groups may be straight-chain, branched-chain, cyclic, or combinations thereof, and may be optionally substituted. Suitable alkenyl groups have from 2 to about 20 carbon atoms.

The term "alkoxy" refers to -OR wherein R is an aliphatic or aromatic group which may be optionally substituted. Methoxy, ethoxy, propoxy, butoxy, and phenoxy are examples of alkoxy groups.

The term "alkyl" refers to saturated aliphatic groups including straight-chain, branched-chain, cyclic and any combinations thereof. Alkyl groups may further be divided into "primary", "secondary", and "tertiary" alkyl groups. In primary alkyl groups, the carbon atom of attachment is substituted with zero (methyl) or one organic radical. In secondary alkyl groups, the carbon atom of attachment is substituted with two organic radicals. In tertiary alkyl groups, the carbon atom of attachment is substituted with three organic radicals.

The term "cycloalkyl" includes organic radicals such as cyclopropenyl, cyclobutenyl, and cyclopentenyl.

The term, "cycloalkenyl" includes organic radicals such as cyclopropenyl, cyclobutenyl, cyclopentenyl, and cyclohexenyl.

The term, "terminal hydroxyalkyl" is a group selected from 3-methyl-3-hydroxypentyl; 3-ethyl-3-hydroxypentyl; 3-ethyl-3-hydroxy-4-methylpentyl; 3-ethyl-3-hydroxy-4,4-dimethylpentyl; 3-methyl-3-hydroxy-4,4-dimethylpentyl; 1-hydroxycycloalkenyl; and 1-hydroxycycloalkyl.

The term, "C₁-C₅ fluoroalkyl" is an alkyl group containing fluorine and includes organic radicals such as -CF₃, -CHF₂, -CH₂F, -CF₂CF₃, -CHF₂CF₃, -CH₂CF₃,

-CH₂CHF₂, and -CH₂CH₂F, with -CF₃ being preferred.

The term, "Active Ingredient" refers to a compound of the invention represented by any of (i) formulae I, II, III, IV, (ii) the product of any example set out herein, or (iii) a compound identified in any row of Tables 1, 2, 3, or 4; or a salt or prodrug derivative of the preceding compound.

The phrase, "compounds of Formula I" refers to "Active Ingredient".

The abbreviation, "Me" means methyl.

The abbreviation, "Et" means ethyl.

The abbreviation, "iPr" means 1-methylethyl.

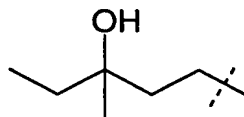
The abbreviation, "tBu" means 1,1-dimethylethyl.

The symbol "-(CH₂)₂- is equivalent to -CH₂-CH₂-.

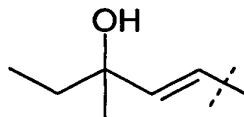
The symbol, "*" in a structural formula identifies a chiral center (except in formula "A" where it symbolizes substitution).

The univalent symbol "-O" in any structural formula is a hydroxyl group (-OH).

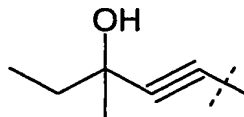
The term, "3-methyl-3-hydroxypentyl" refers to the radical having the structural formula:



The term, "3-methyl-3-hydroxypentenyl" refers to the radical having the structural formula:

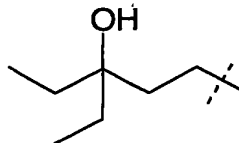


The term, "3-methyl-3-hydroxypentynyl" refers to the radical having the structural formula:

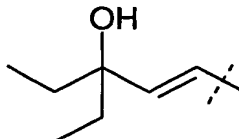


The term, "3-ethyl-3-hydroxypentyl" refers to the radical having the structural formula:

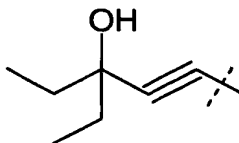
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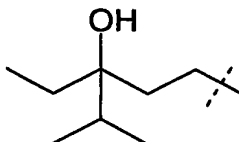
The term, "3-ethyl-3-hydroxypentenyl" refers to the radical having the structural formula:



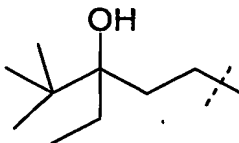
5 The term, "3-ethyl-3-hydroxypentynyl" refers to the radical having the structural formula:



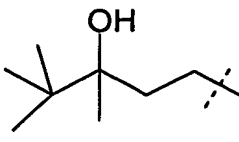
10 The term, "3-ethyl-3-hydroxy-4-methylpentyl" refers to the radical having the structural formula:



The term, "3-ethyl-3-hydroxy-4,4-dimethylpentyl" refers to the radical having the structural formula:



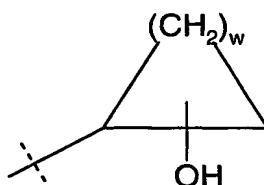
15 The term, "3-methyl-3-hydroxy-4,4-dimethylpentyl" refers to the radical having the structural formula:



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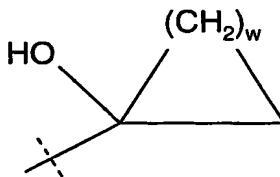
The term, "1-hydroxycycloalkenyl" refers to a radical selected from
 1-hydroxycyclopentenyl, 1-hydroxycyclohexenyl,
 5 1-hydroxycycloheptenyl, or 1-hydroxycyclooctenyl.

The term "hydroxycycloalkyl" refers to a radical having the general structural
 formula:



10 where w is an integer from 1 to 6 and the hydroxyl radical is substituted on any ring carbon atom.

The term "1-hydroxycycloalkyl" refers to a radical having the general structural
 formula:



15

Examples of 1-hydroxycycloalkyl radicals are

1-hydroxycyclopropyl, 1-hydroxycyclobutyl, 1-hydroxycyclopentyl,
 1-hydroxycyclohexyl, 1-hydroxycycloheptyl, and 1-hydroxycyclooctyl.

The abbreviation, "Me" means methyl.

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The abbreviation, "Et" means ethyl.

The abbreviation, "iPr" means 1-methylethyl.

The abbreviation, "tBu" means 1,1-dimethylethyl.

The abbreviation, "3Me3OH-Pentyl" means 3-methyl-3-hydroxypentyl.

The abbreviation, "3Me3OH-Pentenyl" means 3-methyl-3-hydroxypentenyl

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The abbreviation, "3Me3OH-Pentynyl" means 3-methyl-3-hydroxypentynyl

The abbreviation, "3Et3OH-Pentyl" means 3-ethyl-3-hydroxypentyl.

The abbreviation, "3Et3OH-Pentenyl" means 3-ethyl-3-hydroxypentenyl

The abbreviation, "3Et3OH-Pentynyl" means 3-ethyl-3-hydroxypentynyl

The abbreviation, "3Et3OH4Me-Pentyl" means 3-ethyl-3-hydroxy-4-methylpentyl.

The abbreviation, "3Et3OH44DiMe-Pentyl" means 3-ethyl-3-hydroxy-4,4-dimethylpentyl.

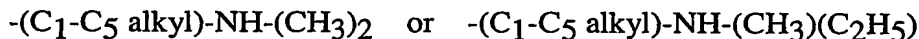
The abbreviation, "3Me3OH44DiMe-Pentyl" means 3-methyl-3-hydroxy-4,4-dimethylpentyl.

The term "C₁-C₅ alkyl" is an alkyl substituent selected from the group consisting of : methyl; ethyl; propyl; 1-methylethyl; 1-methylpropyl; 2-methylpropyl; 1,1-dimethylethyl; 1,1-dimethylpropyl; 1,2-dimethylpropyl; and 2,2-dimethylpropyl. The preferred groups are 2-methylpropyl and 1,1-dimethylethyl, with the 1,1-dimethylethyl group being most preferred.

The symbol "-(C₁-C₅ alkyl)₂" when included as part of a substituent group means two independently selected C₁-C₅ alkyl groups, for example, the generic formula:



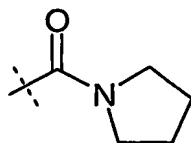
would be descriptive of species including;



The term "amide" refers to derivatives of acids wherein one or more hydroxyl groups is replaced with a amino groups. The amino groups are optionally substituted with one or two organic radicals which may be aliphatic or aromatic. Arnides may be cyclic. The term "carboxamide" refers to an amide of a carboxylic acid. The term "aminocarbonyl" refers to carboxamide radicals wherein the point of attachment is the carbonyl carbon. The term "acylamido" refers to carboxamide radicals wherein the point of attachment is the nitrogen atom.

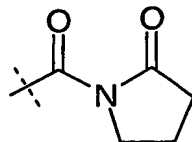
The term, "amine", includes primary, secondary and tertiary amines having respectively one, two, or three organic groups that are attached to the nitrogen atom.

The symbol, "-C(O)-N-pyrrolidine" refers to the radical represented by the formula:

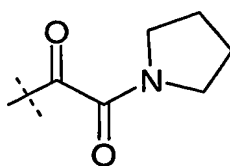


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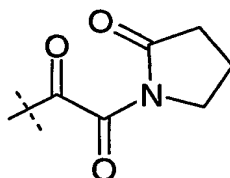
The symbol, “-C(O)-N-pyrrolidin-2-one” refers to the radical represented by the formula:



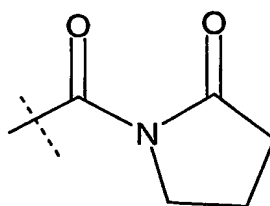
5 The symbol, “-C(O)-C(O)-N-pyrrolidine” refers to the radical represented by the formula:



The symbol, “-C(O)-C(O)-N-pyrrolidin-2-one” refers to the radical represented by the formula:



10 The symbol, “-CH₂-C(O)-N-pyrrolidin-2-one is the organic radical represented by the structural formula:

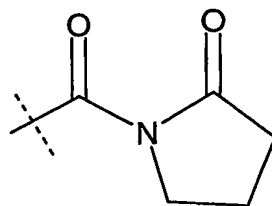


The dotted line symbol crossing a solid line representing a bond

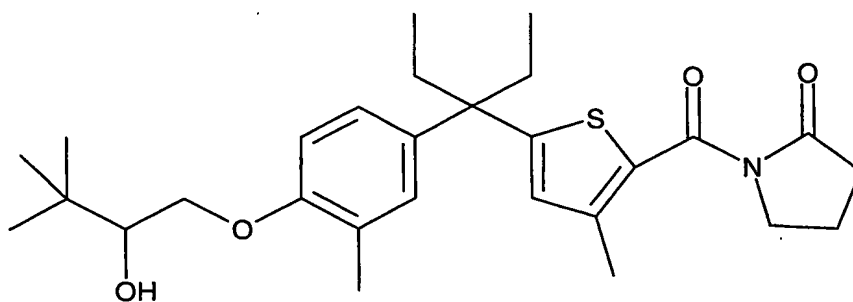


15 means that the bond so marked is the bond attached to the nucleus of formula “(A)” of the parent molecule or to a divalent linking group that is attached to the nucleus of the parent molecule. For example, the group;

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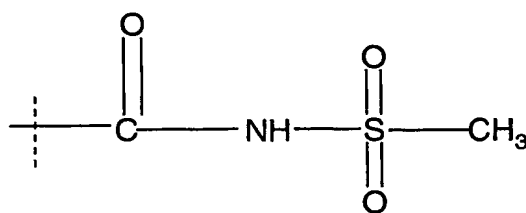


is attached to a parent aryl-thiophene nucleus to provide a compound of the invention as shown;

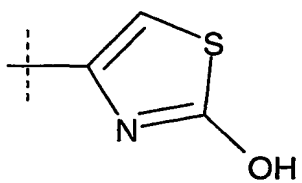
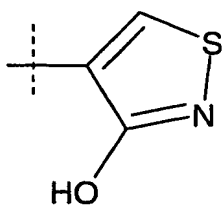
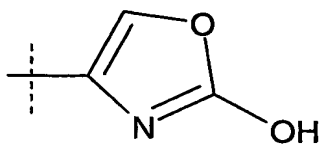
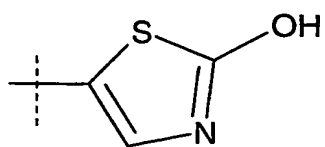
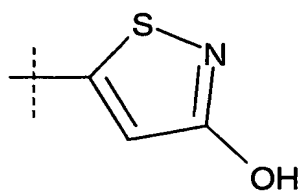
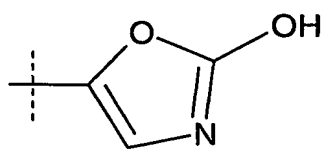
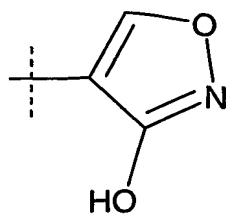
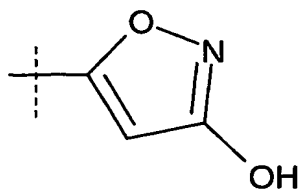


- 5 The term, “(Acidic Group)” means an organic group that acts as a proton donor capable of hydrogen bonding. Illustrative of an (Acidic Group) is a group selected from the following:

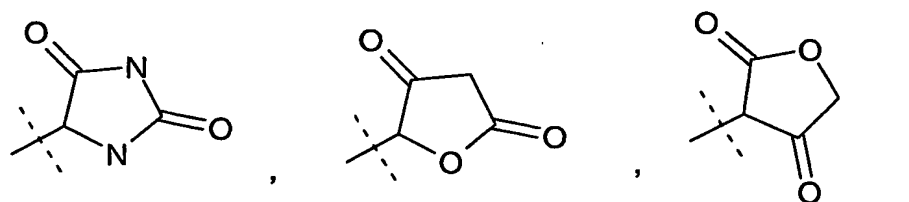
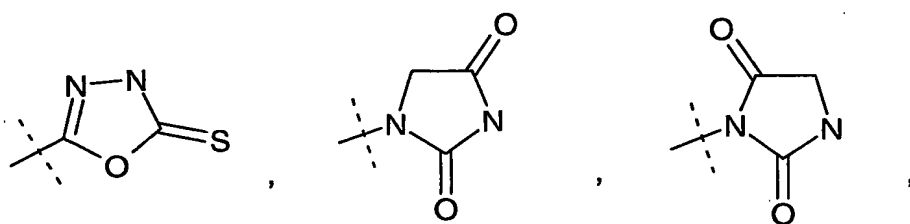
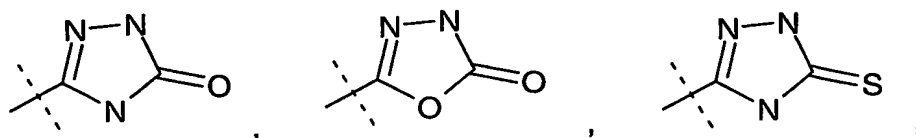
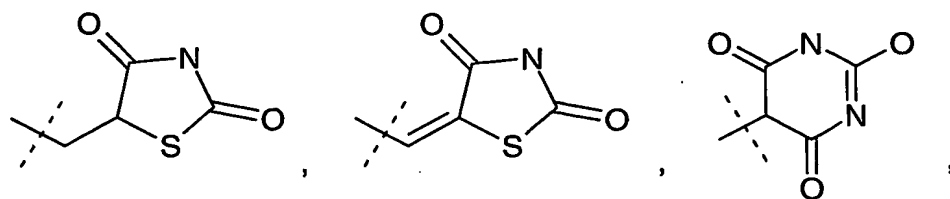
-C(O)OH,
-5-tetrazolyl,



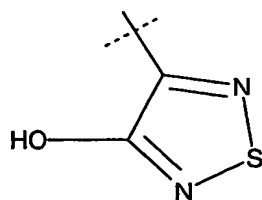
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or

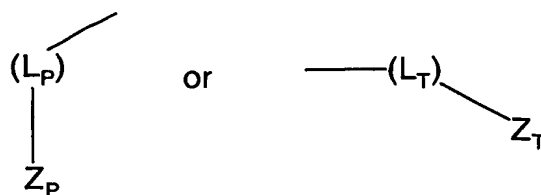


or corresponding salts of the above acids (e.g., Na, K, Ca, or Mg).

The term, "mammal" includes humans.

- 5 The term, "combined group" refers to the pendent binary groups of linkers, -(L)-, and Z substituents represented in formula I by either of:

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The term "ester" refers to compounds wherein a hydroxy group of an acid is replaced with an alkoxide group. For example, a carboxylic ester is one in which the hydroxy group of a carboxylic acid is replaced with an alkoxide. Esters may derive from any acid comprising one or more hydroxy groups: for example, carbonic acid, carbamic acids, phosphonic acids, sulfonic acids, and boronic acids. The terms "alkoxycarbonyl" and "carboalkoxy" refer to carboxylic ester radicals wherein the point of attachment is the carbonyl carbon.

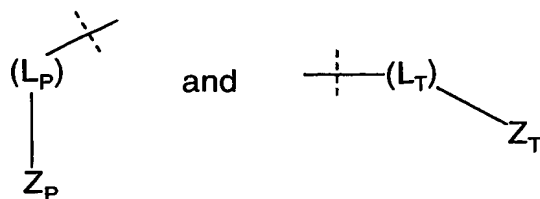
The term "halo" refer to fluorine, chlorine, bromine, and iodine.

The term "substituted" indicate that the group in question is substituted with from one or a plurality of independently selected conventional organic substituents such as acyl, acyloxy, alkenyl, alkoxy, alkyl, amino, aminocarbonyl, aryl, , carboxy, halo, hydroxy, oxa, oxo, perhaloalkyl, perhaloaryl, phosphino, phosphinyl, phosphonyl, sulfinyl, sulfonyl, thia, thio, and combinations and protected derivatives thereof.

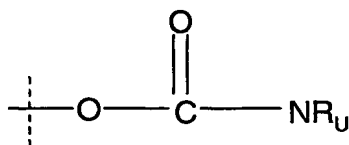
The term "pharmaceutically acceptable salt" includes salts of the compounds used in the method of the present invention derived from the combination of the compound and an organic or inorganic acid or base. In practice, acidic members of the compounds of formulae I and II would be combined with a base or bases, basic members of the compounds of formulae I and II would be combined with an acid or acids, and members of the compounds of formulae I and II with both acid and base functionalities would be combined with one or more acids, bases or any combination thereof. Both the neutral and salt forms fall within the scope of the present invention. Examples of cationic salts are sodium, aluminum, zinc, potassium, calcium, magnesium and ammonium.

The term, "combined groups" refers to the groups in Formula I represented by either of the groups

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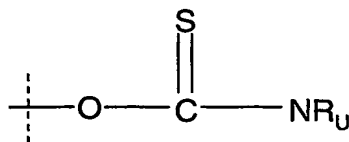


5 The term, "urethane" refers to the radical:



wherein each R_U is independently hydrogen or C_1 - C_8 alkyl, for example, methyl, ethyl, n-propyl, and isopropyl.

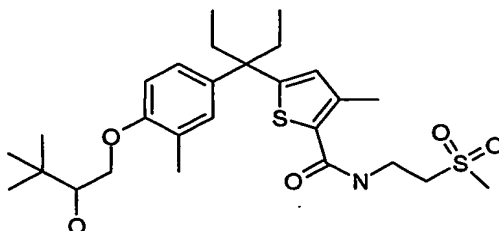
10 The term, "thiourethane refers to the radical:



wherein R_U is hydrogen or C_1 - C_8 alkyl., for example, methyl, ethyl, n-propyl, and isopropyl.

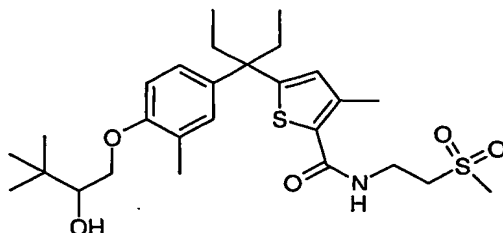
Some of the structural formulae used herein omit depiction of hydrogen atoms.

15 For example, the formula:



is understood to be the equivalent of the formula:

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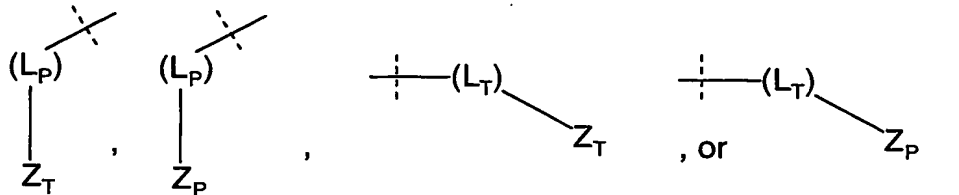


The term, "urethane-type radical" refers to either urethane or thiourethane radicals.

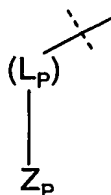
5 Definitions IA: Rule of Polarity and Lipophilicity for Substituents pendant on the compounds used in the method of the invention:

The substituents L_P , L_T , Z_P , and Z_T pendant on the compounds used in the method of the invention are constrained both by (i) the identity of each substituent, and (ii) the polar or lipophilic nature of each substituent. The occurrence of "polar" and "lipophilic" is to be done in accord with the following Rule:

10 **RULE:** The combined groups in formula I, II, III, IV and V represented by



may all be lipophilic, or one may be lipophilic and the other one polar; but both combined groups may not be polar. If any part of a combined group is polar, then the "combined group" itself is deemed polar. For example, in the group

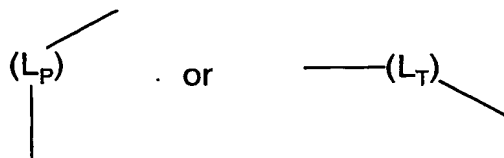


if the divalent linking group $-(L_P)-$ is the polar group, $-C(O)-NH-$ and Z_P is the lipophilic group, $-CH_2-CH_2-(t-butyl)$; then the combined group is defined as "polar."

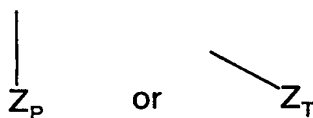
20 Definitions IB: Definition of "Polar" and "Lipophilic"

-16-

The term "lipophilic group" refers to any linking group

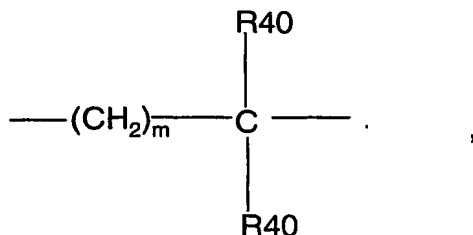
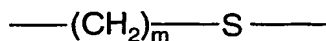
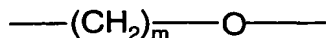
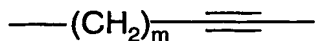
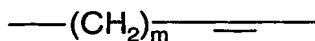


or any of the Z substituents



that is hydrophobic, preferring or attracted to a hydrocarbon loving, non-aqueous environment. Lipophilic linking groups in the practice of the method of invention are

a bond



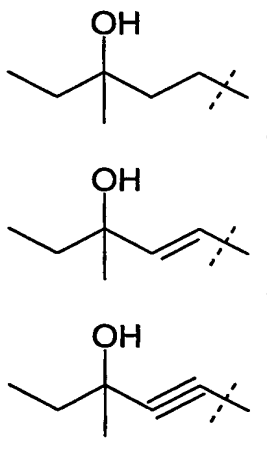
where m is 0, 1, or 2, and each R₄₀ is independently hydrogen, -CH₃, -F, -CH₂F, -CHF₂, and -CF₃. All other exemplified linking groups are polar.

Generally all linking groups containing only hydrocarbon subunit groups or hydrocarbon subunit groups in combination with ether or thioether groups are lipophilic. Moreover, fluorinated derivatives of such groups are considered lipophilic.

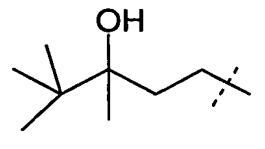
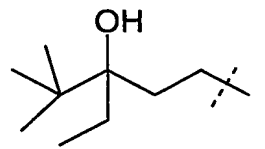
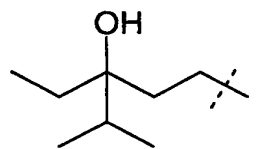
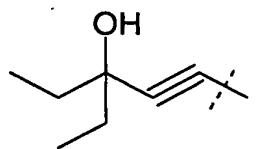
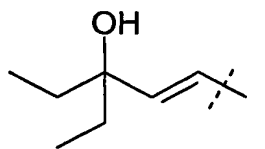
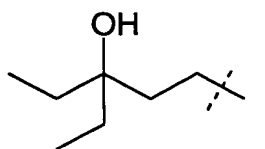
Lipophilic Z_T or Z_P groups in the practice of the invention are partially exemplified by

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- 5
- O-CH₂-C(O)-C₁-C₅alkyl,
 - O-CH₂-CH(OH)-C₁-C₅alkyl,
 - O-CH₂-C(CH₃)(OH)-C₁-C₅alkyl,
 - O-CH₂-CH(OCH₃)-C₁-C₅alkyl,
 - O-CH(CH₃)-C(O)-C₁-C₅alkyl
 - O-CH(CH₃)-CH(OH)-C₁-C₅alkyl,
 - O-CH₂-C(O)-C(CH₃)₂-C₁-C₅alkyl,
 - O-CH₂-CH(OH)-C(CH₃)₂-C₁-C₅alkyl,
- 10
- O-CH₂-C(O)-C₁-C₅alkyl,
 - O-CH₂-CH(OH)-C₁-C₅alkyl,
 - O-CH₂-CH(OCH₃)-C₁-C₅alkyl,
 - CH₂-CH₂-C(O)-C₁-C₅alkyl,
 - CH₂-CH₂-CH(OH)-C₁-C₅alkyl,
 - CH₂-CH₂-CH(OCH₃)-C₁-C₅alkyl,
- 15
- CH₂-C(O)-C₁-C₅alkyl,
 - CH₂-CH(OH)-C₁-C₅alkyl,
 - CH₂-C(CH₃)(OH)-C₁-C₅alkyl,
 - CH(CH₃)-C(O)-C₁-C₅alkyl,
 - CH(CH₃)-CH(OH)-C₁-C₅alkyl,
- 20
- CH(CH₃)-C(CH₃)(OH)-C₁-C₅alkyl,



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1-hydroxycyclopentenyl,

1-hydroxycyclohexenyl,

1-hydroxycycloheptenyl,

1-hydroxycyclooctenyl,

1-hydroxycyclopropyl,

1-hydroxycyclobutyl,

1-hydroxycyclopentyl,

1-hydroxycyclohexyl,

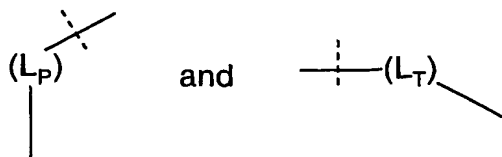
1-hydroxycycloheptyl,

and

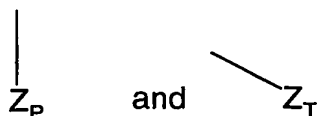
1-hydroxycyclooctyl.

-19-

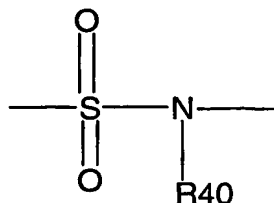
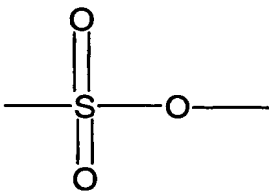
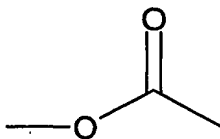
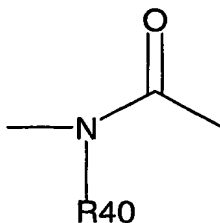
Conversely, the term "polar group" refers to any linking group



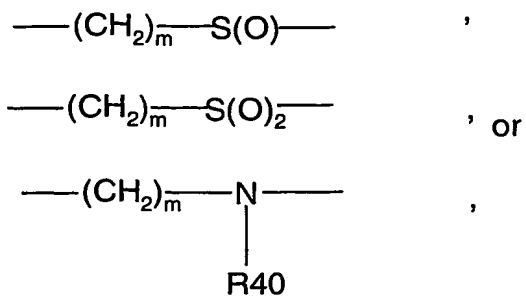
that is not a lipophilic group. The term "polar group" also refers to any Z substituent



- 5 that is not a lipophilic group. The term, "polar" as used herein generally refers to chemical substituents that are hydrophilic, preferring or attracted to an aqueous environment. An example of a polar linking group is a linking group selected from the following:



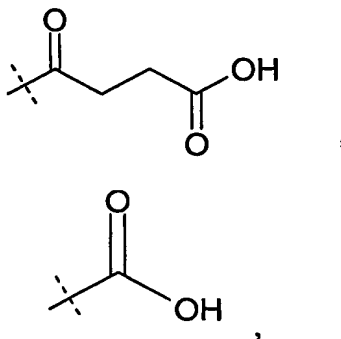
-20-



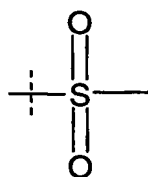
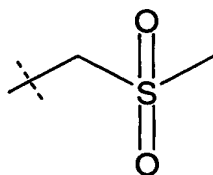
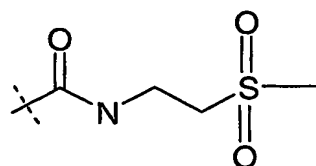
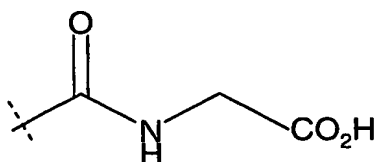
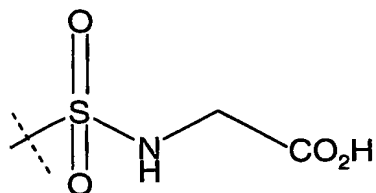
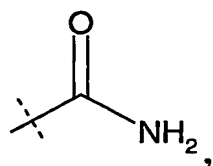
where m is 0, 1, or 2 and R40 is as previously defined.

Exemplary polar Z_T or Z_P groups in the practice of the method of the invention are depicted by the following formulae:

5



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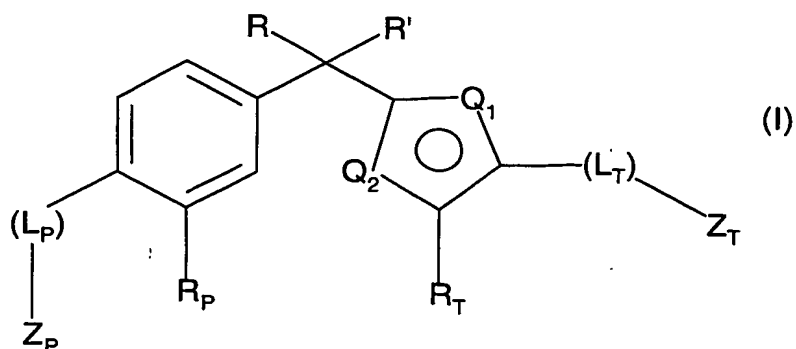
5

II. Compounds of the Invention:

The compounds used in the method of the invention are Vitamin D Receptor Modulators represented by formula I or a pharmaceutically acceptable salt or prodrug derivative thereof:

10

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wherein;

R and R' are independently C₁-C₅ alkyl, C₁-C₅ fluoroalkyl, or together R and R' form a substituted or unsubstituted, saturated or unsaturated carbocyclic ring having from
5 3 to 8 carbon atoms;

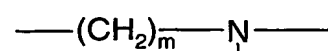
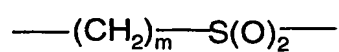
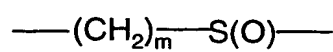
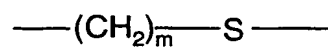
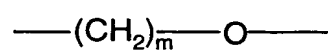
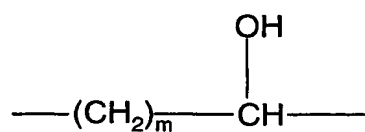
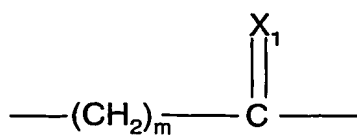
Ring atoms Q₁ and Q₂ are independently selected from carbon or sulfur, with the proviso that one atom is sulfur and the other atom is carbon;

R_P and R_T are independently selected from the group consisting of hydrogen, halo, C₁-C₅ alkyl, C₁-C₅ fluoroalkyl, -O-C₁-C₅ alkyl, -S-C₁-C₅ alkyl, -O-C₁-C₅
10 fluoroalkyl, -CN, -NO₂, acetyl, -S-C₁-C₅ fluoroalkyl, C₂-C₅ alkenyl, C₃-C₅ cycloalkyl, and C₃-C₅ cycloalkenyl;

(L_P) and (L_T) are divalent linking groups independently selected from the group consisting of

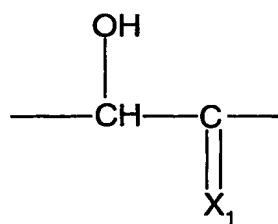
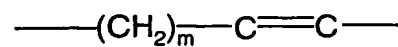
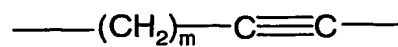
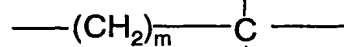
-23-

a bond ,

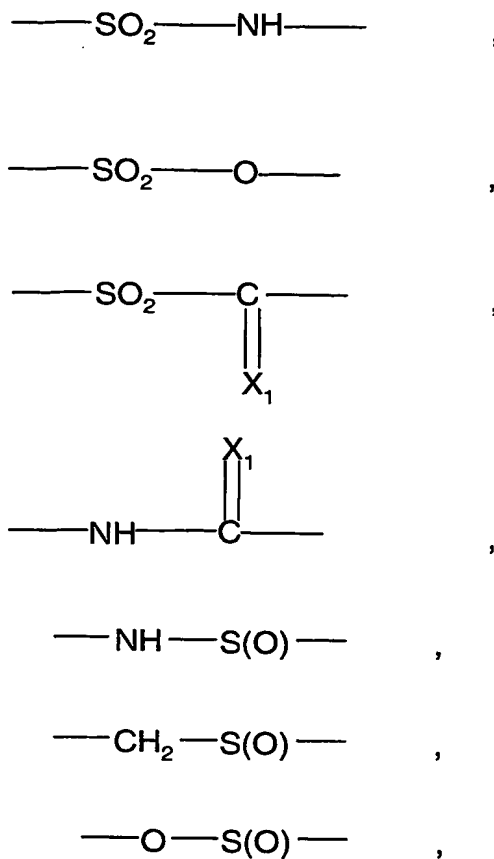


R40

R40



-24-



5

where m is 0, 1 or 2, X₁ is oxygen or sulfur, and each R₄₀ is independently hydrogen or C₁-C₅ alkyl or C₁-C₅ fluoroalkyl;

Z_P and Z_T are independently selected from

- 10
- hydrogen,
 - phenyl,
 - benzyl,
 - fluorophenyl,
 - 15 -(C₁-C₅ alkyl),
 - (C₂-C₅ alkenyl),
 - (C₃-C₅ cycloalkyl),
 - (C₃-C₅ cycloalkenyl),
 - (C₁-C₅ hydroxyalkyl),
 - (C₁-C₅ fluoroalkyl),
 - (C₁-C₅ alkyl)-phenyl,

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-(C₁-C₅ alkyl)-O-(C₁-C₅) alkyl,
 -(C₁-C₅ alkyl)-NH₂,
 -(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,
 5 -(C₁-C₅ alkyl)-C(O)-NH₂,
 -(C₁-C₅ alkyl)-C(O)-NH-(C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-C(O)-N-(C₁-C₅ alkyl)₂,
 -(C₁-C₅ alkyl)-C(O)-(C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-NH-SO₂-(C₁-C₅ alkyl),
 10 -(C₁-C₅ alkyl)-N-pyrrolidin-2-one,
 -(C₁-C₅ alkyl)-N-pyrrolidine,
 -(C₁-C₅ alkyl)-(1-methylpyrrolidin-2-one-3-yl),
 -(C₁-C₅ alkyl)-C(O)-(O-C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-C(O)-OH,
 15 -(C₁-C₅ alkyl)-5-tetrazolyl,
 -(C₁-C₅ alkyl)-P(O)-(O-C₁-C₅ alkyl)₂,
 -(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-SO₂-NH₂,
 -(C₁-C₅ alkyl)-SO₂-NH-(C₁-C₅ alkyl),
 20 -(C₁-C₅ alkyl)-SO₂-N-(C₁-C₅ alkyl)₂,
 -(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-S(O)-NH₂,
 -(C₁-C₅ alkyl)-S(O)-NH-(C₁-C₅ alkyl),
 25 -(C₁-C₅ alkyl)-S(O)-N-(C₁-C₅ alkyl)₂,
 -(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
 -(C₁-C₅ alkyl)-N(C(O)(C₁-C₅ alkyl)CH₂C(O)OH,
 -(C₁-C₅ alkyl)-N(C(O)(C₁-C₅ alkyl)CH₂C(O)-(C₁-C₅
 alkyl),
 30
 -CH(OH)-(C₁-C₅ alkyl)
 -CH(OH)-(C₂-C₅ alkenyl),

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- 5
- CH(OH)-(C₃-C₅ cycloalkyl),
 - CH(OH)-(C₃-C₅ cycloalkenyl),
 - CH(OH)-(C₁-C₅ hydroxyalkyl),
 - CH(OH)-(C₁-C₅ fluoroalkyl),
 - CH(OH)-phenyl
 - CH(OH)-5-tetrazolyl,
 - CH(OH)-(1-methylpyrrolidin-2-one-3-yl),
- 10
- C(O)-(C₁-C₅ alkyl),
 - C(O)-(C₁-C₅ alkyl)-C(O)OH,
 - C(O)-(C₁-C₅ alkyl)-C(O)(O-C₁-C₅ alkyl),
 - C(O)-(C₂-C₅ alkenyl),
 - C(O)-(C₃-C₅ cycloalkyl),
 - C(O)-(C₃-C₅ cycloalkenyl),
- 15
- C(O)-(C₁-C₅ hydroxyalkyl),
 - C(O)-(C₁-C₅ fluoroalkyl),
 - C(O)-(C₁-C₅ alkyl)-phenyl
 - C(O)-O-(C₁-C₅ alkyl),
 - C(O)-O-(C₂-C₅ alkenyl),
- 20
- C(O)-O-(C₃-C₅ cycloalkyl),
 - C(O)-O-(C₃-C₅ cycloalkenyl),
 - C(O)-O-(C₁-C₅ hydroxyalkyl),
 - C(O)-O-(C₁-C₅ fluoroalkyl),
 - C(O)-O-(C₁-C₅ alkyl)-phenyl,
- 25
- C(O)-NH₂,
 - C(O)-NH(OH),
 - C(O)-NH-(C₁-C₅ alkyl),
 - C(O)-N-(C₁-C₅ alkyl)₂,
 - C(O)-NH-(C₂-C₅ alkenyl),
- 30
- C(O)-NH-(C₃-C₅ cycloalkyl),
 - C(O)-NH-(C₃-C₅ cycloalkenyl),
 - C(O)-NH-(C₁-C₅ fluoroalkyl),

-27-

- 5
- C(O)-NH-(C₁-C₅ alkyl)-phenyl,
 - C(O)-NH-SO₂-(C₁-C₅ alkyl),
 - C(O)-NH-SO₂-(C₂-C₅ alkenyl),
 - C(O)-NH-SO₂-(C₃-C₅ cycloalkyl),
 - C(O)-NH-SO₂-(C₃-C₅ cycloalkenyl),
 - C(O)-NH-S(O)-(C₁-C₅ alkyl),
 - C(O)-NH-S(O)-(C₂-C₅ alkenyl),
 - C(O)-NH-S(O)-(C₃-C₅ cycloalkyl),
 - C(O)-NH-S(O)-(C₃-C₅ cycloalkenyl),

10

 - C(O)-NH-(C₁-C₅ fluoroalkyl),
 - C(O)-NH-(C₁-C₅ alkyl)-phenyl
 - C(O)-NH-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
 - C(O)-NH-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
 - C(O)-NH-CH₂-C(O)OH

15

 - C(O)-NH-CH₂-C(O)-(O-C₁-C₅ alkyl),
 - C(O)-N-(C₁-C₅ alkyl)(C(O)OH),
 - C(O)-N-(C₁-C₅ alkyl)(C(O)-(O-C₁-C₅ alkyl)),
 - C(O)-NH-CH((CH₂)(CO₂H))(CO₂H),
 - C(O)-NH-CH((CH₂)(C(O)-(C₁-C₅ alkyl)))(C(O)-(O-C₁-

20

 - C₅ alkyl)),
 - C(O)-NH-CH((CH₂OH)(CO₂H)),
 - C(O)-NH-CH((CH₂OH)(C(O)(O-C₁-C₅ alkyl))),
 - C(O)-NH-C((C₁-C₅ alkyl)(C₁-C₅ alkyl))(CO₂H),
 - C(O)-NH-C((C₁-C₅ alkyl)(C₁-C₅ alkyl))(C(O)-(O-C₁-C₅

25

 - alkyl)),
 - C(O)-NH-5-tetrazolyl,
 - C(O)-N-pyrrolidin-2-one,
 - C(O)-N-pyrrolidine,
 - C(O)-(1-methylpyrrolidin-2-one-3-yl),

30

 - C(O)-(C₁-C₅ alkyl)-N-pyrrolidin-2-one,
 - C(O)-(C₁-C₅ alkyl)-N-pyrrolidine,
 - C(O)-(C₁-C₅ alkyl)-(1-methylpyrrolidin-2-one-3-yl),

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- C(O)-N-pyrrolidin-2-(CO₂H),
 -C(O)-N-pyrrolidin-2-(C(O)-(O-C₁-C₅ alkyl)),
 -C(O)-N-(C(O)-(C₁-C₅ alkyl))CH₂(CO₂H),
 -C(O)-N-(C(O)-(C₁-C₅ alkyl))CH₂(C(O)-(O-C₁-C₅ alkyl)),
 -C(O)-N-(C₁-C₅ alkyl))CH₂(CO₂H),
 -C(O)-C(O)-OH,
 -C(O)-C(O)-(C₁-C₅ alkyl),
 -C(O)-C(O)-(C₂-C₅ alkenyl),
 -C(O)-C(O)-(C₃-C₅ cycloalkyl),
 -C(O)-C(O)-(C₃-C₅ cycloalkenyl),
 -C(O)-C(O)-(C₁-C₅ hydroxyalkyl),
 -C(O)-C(O)-(C₁-C₅ fluoroalkyl),
 -C(O)-C(O)-(C₁-C₅ alkyl)-phenyl,
 -C(O)-C(O)-NH₂,
 -C(O)-C(O)-NH-(C₁-C₅ alkyl),
 -C(O)-C(O)-N-(C₁-C₅ alkyl)₂,
 -C(O)-C(O)-5-tetrazolyl,
 -C(O)-C(O)-N-pyrrolidin-2-one,
 -C(O)-C(O)-N-pyrrolidine,
 -C(O)-C(O)-(1-methylpyrrolidin-2-one-3-yl),
 -O-(C₁-C₅ alkyl),
 -O-(C₂-C₅ alkenyl),
 -O-(C₃-C₅ cycloalkyl),
 -O-(C₃-C₅ cycloalkenyl),
 -O-(C₁-C₅ hydroxyalkyl),
 -O-(C₁-C₅ fluoroalkyl),
 -O-(C₁-C₅ alkyl)-phenyl,
 -O-(C₁-C₅ alkyl)-(O)-(C₁-C₅ alkyl),
 -O-(C₁-C₅ alkyl) NH₂,
 -O-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl)₂,

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- 5
- O-(C₁-C₅ alkyl)-C(O)-NH₂,
-O-(C₁-C₅ alkyl)-C(O)-NH-(C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-C(O)-N-(C₁-C₅ alkyl)₂,
-O-(C₁-C₅ alkyl)-C(O)-OH,
-O-(C₁-C₅ alkyl)-C(O)-NH-5-tetrazolyl,
-O-(C₁-C₅ alkyl)-C(O)-(C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-C(O)-(O-C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-NH₂,
-O-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),
10 -O-(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,
-O-(C₁-C₅ alkyl)-NH-SO₂-(C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-N-pyrrolidin-2-one,
-O-(C₁-C₅ alkyl)-N-pyrrolidine,
-O-(C₁-C₅ alkyl)-(1-methylpyrrolidin-2-one-3-yl),
15 -O-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-SO₂-NH₂,
-O-(C₁-C₅ alkyl)-SO₂-NH-(C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-SO₂-N-(C₁-C₅ alkyl)₂,
-O-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
20 -O-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-S(O)-NH₂,
-O-(C₁-C₅ alkyl)-S(O)-NH-(C₁-C₅ alkyl),
-O-(C₁-C₅ alkyl)-S(O)-N-(C₁-C₅ alkyl)₂,
-O-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
25 -O-(C₁-C₅ alkyl)-P(O)-(O-C₁-C₅ alkyl)₂,
-O-(C₁-C₅ alkyl)-5-tetrazolyl,
-O-CH₂-CO₂H,
-O-CH₂-5-tetrazolyl,
-O-(C₁-C₅ alkyl),
30 -O-C(O)-NH₂,
-O-C(O)-N-(CH₃)₂,
-O-C(S)-N-(CH₃)₂,

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- 5
- O-C(O)-O-(C₁-C₅ alkyl),
 - O-(5-tetrazolyl),
 - O-SO₂-(C₁-C₅ alkyl),
 - O-SO₂-NH₂,
 - O-SO₂-NH-(C₁-C₅ alkyl),
 - O-SO₂-N-(C₁-C₅ alkyl)₂,
 - O-S(O)-(C₁-C₅ alkyl),
 - O-S(O)-NH₂,
 - O-S(O)-NH-(C₁-C₅ alkyl),
 - 10 -O-S(O)-N-(C₁-C₅ alkyl)₂,
- 15
- S-(C₁-C₅ alkyl),
 - S-(C₂-C₅ alkenyl),
 - S-(C₃-C₅ cycloalkyl),
 - S-(C₃-C₅ cycloalkenyl),
 - S-(C₁-C₅ fluoroalkyl),
 - S-(C₁-C₅ hydroxyalkyl),
 - S-(C₁-C₅ alkyl)-phenyl,
 - S-(C₁-C₅ alkyl)-O-(C₁-C₅ alkyl),
 - 20 -S-(C₁-C₅ alkyl)-C(O)-OH,
 - S-(C₁-C₅ alkyl)-C(O)-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-C(O)-O-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-C(O)-NH₂,
 - S-(C₁-C₅ alkyl)-C(O)-NH-(C₁-C₅ alkyl),
 - 25 -S-(C₁-C₅ alkyl)-C(O)-N-(C₁-C₅ alkyl)₂,
 - S-(C₁-C₅ alkyl) NH₂,
 - S-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,
 - S-(C₁-C₅ alkyl)-NH-SO₂-(C₁-C₅ alkyl),
 - 30 -S-(C₁-C₅ alkyl)-N-pyrrolidin-2-one,
 - S-(C₁-C₅ alkyl)-N-pyrrolidine,
 - S-(C₁-C₅ alkyl)-(1-methylpyrrolidin-2-one-3-yl),

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- 5
- S-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-SO₂-NH₂,
 - S-(C₁-C₅ alkyl)-SO₂-NH-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-SO₂-N-(C₁-C₅ alkyl)₂,
 - S-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-P(O)-(O-C₁-C₅ alkyl)₂,
 - S-(C₁-C₅ alkyl)-5-tetrazolyl,
 - S-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-S(O)-NH₂,

10

 - S-(C₁-C₅ alkyl)-S(O)-NH-(C₁-C₅ alkyl),
 - S-(C₁-C₅ alkyl)-S(O)-N-(C₁-C₅ alkyl)₂,
 - S-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),

15

 - SO₂-(C₁-C₅ alkyl),
 - SO₂-(C₂-C₅ alkenyl),
 - SO₂-(C₃-C₅ cycloalkyl),
 - SO₂-(C₃-C₅ cycloalkenyl),
 - SO₂-(C₁-C₅ hydroxyalkyl),
 - SO₂-(C₁-C₅ fluoroalkyl),

20

 - SO₂-(C₁-C₅)-phenyl,

25

 - SO₂-NH₂,
 - SO₂-NH-(C₁-C₅ alkyl),
 - SO₂-NH-CH₂-C(O)OH,
 - SO₂-NH-CH₂-C(O)(O-C₁-C₅ alkyl),
 - SO₂-NH-(C₁-C₅ alkyl)-C(O)OH,
 - SO₂-NH-(C₁-C₅ alkyl)-C(O)(O-C₁-C₅ alkyl),
 - SO₂-NHC(O)-(C₃-C₆ cycloalkyl),

30

 - SO₂-NH-C(O)-(C₁-C₅ alkyl),
 - SO₂-N-(C₁-C₅ alkyl)₂,
 - SO₂-(C₁-C₅ alkyl)-O-(C₁-C₅ alkyl),

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- 5 -SO₂-(C₁-C₅ alkyl)-C(O)-(C₁-C₅ alkyl),
 -SO₂-(C₁-C₅ alkyl) NH₂,
 -SO₂-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),
 -SO₂-(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,
 -SO₂-(C₁-C₅ alkyl)-C(O)-NH₂,
 -SO₂-(C₁-C₅ alkyl)-C(O)-NH-(C₁-C₅ alkyl),
 -SO₂-(C₁-C₅ alkyl)-C(O)-N-(C₁-C₅ alkyl)₂,
 -SO₂-(C₁-C₅ alkyl)-NH-SO₂-(C₁-C₅ alkyl),
 -SO₂-(C₁-C₅ alkyl)-N-pyrrolidin-2-one,
10 -SO₂-(C₁-C₅ alkyl)-N-pyrrolidine,
 -SO₂-(C₁-C₅ alkyl)-(1-methylpyrrolidin-2-one-3-yl),
 -SO₂-(C₁-C₅ alkyl)-C(O)-O-(C₁-C₅ alkyl),
 -SO₂-(C₁-C₅ alkyl)-C(O)-OH,
 -SO₂-(C₁-C₅ alkyl)-5-tetrazolyl,
15 -SO₂-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
 -SO₂-(C₁-C₅ alkyl)-SO₂-NH₂,
 -SO₂-(C₁-C₅ alkyl)-SO₂-NH-(C₁-C₅ alkyl),
 -SO₂-(C₁-C₅ alkyl)-SO₂-N-(C₁-C₅ alkyl)₂,
 -SO₂-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
20 -SO₂-(C₁-C₅ alkyl)-P(O)-(O-C₁-C₅ alkyl)₂ ,
 -SO₂-(C₁-C₅ alkyl),
 -SO₂-(C₂-C₅ alkenyl),
 -SO₂-(C₃-C₅ cycloalkyl),
 -SO₂-(C₃-C₅ cycloalkenyl),
25 -SO₂-(C₁-C₅ hydroxyalkyl),
 -SO₂-(C₁-C₅ fluoroalkyl),
 -SO₂-(C₁-C₅)-phenyl,
 -SO₂-N=CHN(C₁-C₅ alkyl)₂,
30 -S(O)-NH₂,
 -S(O)-NH-(C₁-C₅ alkyl),
 -S(O)-NH-CH₂-C(O)OH

5
-S(O)-NH-(C₁-C₅ alkyl)-C(O)OH,
-S(O)-NH-CH₂-C(O)(O-C₁-C₅ alkyl),
-S(O)-NH-(C₁-C₅ alkyl)-C(O)(O-C₁-C₅ alkyl),
-S(O)HC(O)-(C₃-C₆ cycloalkyl),
-S(O)-NH-C(O)-(C₁-C₅ alkyl),
-S(O)-N-(C₁-C₅ alkyl)₂,
-S(O)-(C₁-C₅ alkyl)-O-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-C(O)-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-C(O)-(O-C₁-C₅ alkyl),
10
-S(O)-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,
-S(O)-(C₁-C₅ alkyl)-C(O)-NH₂,
-S(O)-(C₁-C₅ alkyl)-C(O)-NH-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-C(O)-N-(C₁-C₅ alkyl)₂,
15
-S(O)-(C₁-C₅ alkyl)-NH-SO₂-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-NH-S(O)-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-N-pyrrolidin-2-one,
-S(O)-(C₁-C₅ alkyl)-N-pyrrolidine,
-S(O)-(C₁-C₅ alkyl)-(1-methylpyrrolidin-2-one-3-yl),
20
-S(O)-(C₁-C₅ alkyl)-C(O)-(O-C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-C(O)-OH,
-S(O)-(C₁-C₅ alkyl)-5-tetrazolyl,
-S(O)-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
25
-S(O)-(C₁-C₅ alkyl)-SO₂-NH₂,
-S(O)-(C₁-C₅ alkyl)-S(O)-NH₂,
-S(O)-(C₁-C₅ alkyl)-SO₂-NH-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-S(O)-NH-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-SO₂-N-(C₁-C₅ alkyl)₂,
30
-S(O)-(C₁-C₅ alkyl)-S(O)-N-(C₁-C₅ alkyl)₂,
-S(O)-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),
-S(O)-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),

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-S(O)-(C₁-C₅ alkyl)-P(O)-(O-C₁-C₅ alkyl)₂ ,

-S(O)-N=CHN(C₁-C₅ alkyl)₂,

-NHC(S)NH₂,

5

-NHC(S)NH-(C₁-C₅ alkyl),

-NHC(S)N-(C₁-C₅ alkyl)₂,

-NHC(S)NH-(C₂-C₅ alkenyl),

-NHC(S)NH-(C₃-C₅ cycloalkyl),

-NHC(S)NH-(C₃-C₅ cycloalkenyl),

10

-NHC(S)NH-(C₁-C₅ fluoroalkyl),

-NHC(S)NH-C₁-C₅ hydroxyalkyl,

-NHC(S)NH-(C₁-C₅ fluoroalkyl)

-NHC(S)NH-phenyl,

-NHC(S)NH-(C₁-C₅ alkyl)-C(O)-OH,

15

-NHC(S)NH-(C₁-C₅ alkyl)-O-(C₁-C₅ alkyl),

-NHC(S)NH-(C₁-C₅ alkyl)-C(O)-(C₁-C₅ alkyl),

-NHC(S)NH-(C₁-C₅ alkyl)-C(O)-(O-C₁-C₅ alkyl),

-NHC(S)NH-(C₁-C₅ alkyl)-NH₂,

-NHC(S)NH-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),

20

-NHC(S)NH-(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,

-NHC(S)NH-(C₁-C₅ alkyl)-C(O)-NH₂,

-NHC(S)NH-(C₁-C₅ alkyl)-C(O)-NH-(C₁-C₅ alkyl),

-NHC(S)NH-(C₁-C₅ alkyl)-C(O)-N-(C₁-C₅ alkyl)₂,

-NHC(S)NH-(C₁-C₅ alkyl)-NH-SO₂-(C₁-C₅ alkyl),

25

-NHC(S)NH-(C₁-C₅ alkyl)-NH-S(O)-(C₁-C₅ alkyl),

-NHC(S)NH-(C₁-C₅ alkyl)-N-pyrrolidin-2-one,

-NHC(S)NH-(C₁-C₅ alkyl)-N-pyrrolidine,

-NHC(S)NH-(C₁-C₅ alkyl)-(1-methylpyrrolidin-2-one-3-yl),

30

-NHC(S)NH-(C₁-C₅ alkyl)-5-tetrazolyl,

-NHC(S)NH-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),

-NHC(S)NH-(C₁-C₅ alkyl)-SO₂-NH₂,

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-NHC(S)NH-(C₁-C₅ alkyl)-SO₂-NH-(C₁-C₅ alkyl),
-NHC(S)NH-(C₁-C₅ alkyl)-SO₂-N-(C₁-C₅ alkyl)₂,
-NHC(S)NH-(C₁-C₅ alkyl)-S(O)-(C₁-C₅ alkyl),
-NHC(S)NH-(C₁-C₅ alkyl)-S(O)-NH₂,
5 -NHC(S)NH-(C₁-C₅ alkyl)-S(O)-NH-(C₁-C₅ alkyl),
-NHC(S)NH-(C₁-C₅ alkyl)-S(O)-N-(C₁-C₅ alkyl)₂,
-NHC(S)NH-(C₁-C₅ alkyl)-P(O)-(O-C₁-C₅ alkyl)₂,

-NHC(O)NH₂,
10 -NHC(O)NH-(C₁-C₅ alkyl),
-NHC(O)N-(C₁-C₅ alkyl)₂,
-NHC(O)NH-(C₂-C₅ alkenyl),
-NHC(O)NH-(C₃-C₅ cycloalkyl),
-NHC(O)NH-(C₃-C₅ cycloalkenyl),
15 -NHC(O)NH-(C₁-C₅ hydroxyalkyl),
-NHC(O)NH-(C₁-C₅ fluoroalkyl),
-NHC(O)NH-phenyl,
-NHC(O)NH-(C₁-C₅ alkyl)-NH₂,
-NHC(O)NH-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),
20 -NHC(O)NH-(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,
-NHC(O)NH-(C₁-C₅ alkyl)-O-(C₁-C₅ alkyl),
-NHC(O)NH-(C₁-C₅ alkyl)-NH₂,
-NHC(O)NH-(C₁-C₅ alkyl)-NH-(C₁-C₅ alkyl),
-NHC(O)NH-(C₁-C₅ alkyl)-N-(C₁-C₅ alkyl)₂,
25 -NHC(O)NH-(C₁-C₅ alkyl)-C(O)-NH₂,
-NHC(O)NH-(C₁-C₅ alkyl)-C(O)-NH-(C₁-C₅ alkyl),
-NHC(O)NH-(C₁-C₅ alkyl)-C(O)-N-(C₁-C₅ alkyl)₂,
-NHC(O)NH-(C₁-C₅ alkyl)-C(O)-(C₁-C₅ alkyl),
-NHC(O)NH-(C₁-C₅ alkyl)-NH-SO₂-(C₁-C₅ alkyl),
30 -NHC(O)NH-(C₁-C₅ alkyl)-N-pyrrolidin-2-one,
-NHC(O)NH-(C₁-C₅ alkyl)-N-pyrrolidine,
-NHC(O)NH-(C₁-C₅ alkyl)-

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(1-methylpyrrolidin-2-one-3-yl),

-NHC(O)NH-(C₁-C₅ alkyl)-C(O)-OH,-NHC(O)NH-(C₁-C₅ alkyl)-C(O)-O-(C₁-C₅ alkyl),-NHC(O)NH-(C₁-C₅ alkyl)-5-tetrazolyl,

5

-NHC(O)NH-(C₁-C₅ alkyl)-SO₂-(C₁-C₅ alkyl),-NHC(O)NH-(C₁-C₅ alkyl)-SO₂-NH₂,-NHC(O)NH-(C₁-C₅ alkyl)-SO₂-NH-(C₁-C₅ alkyl),-NHC(O)NH-(C₁-C₅ alkyl)-SO₂-N-(C₁-C₅ alkyl)₂,-NHC(O)NH-(C₁-C₅ alkyl)-P(O)-O-(C₁-C₅ alkyl)₂,

10

-NH₂,-NH-(C₁-C₅ alkyl),-NH-CH₂-C(O)OH,-N-(C₁-C₅ alkyl)₂,-NH-C(O)-NH₂,

15

-NH-C(O)-NH-(C₁-C₅ alkyl),-NH-C(O)-N-(C₁-C₅ alkyl)₂,-NH-C(O)-(C₁-C₅ alkyl),-NH-SO₂-(C₁-C₅ alkyl),-NH-S(O)-(C₁-C₅ alkyl),

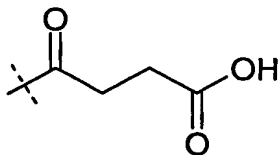
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-N(CH₃)(OCH₃),-N(OH)(CH₃),

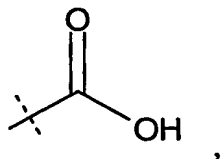
-N-pyrrolidin-2-one,

-N-pyrrolidine,

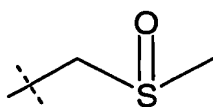
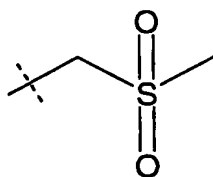
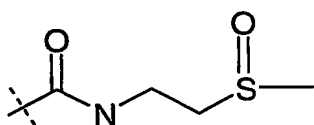
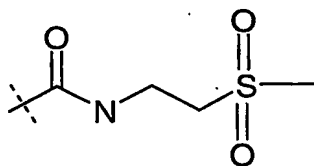
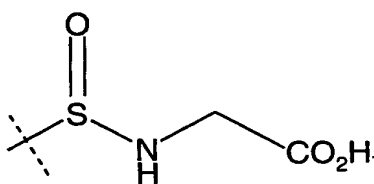
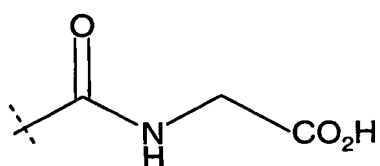
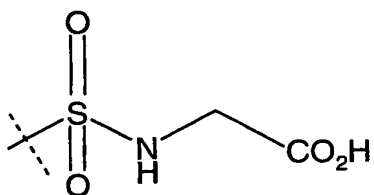
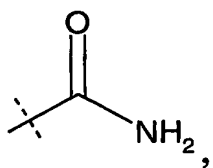
-(1-methylpyrrolidin-2-one-3-yl),



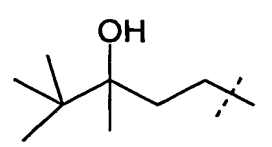
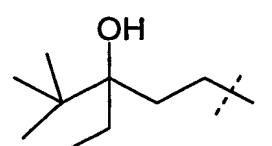
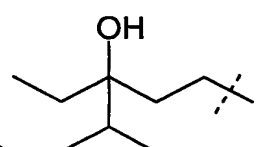
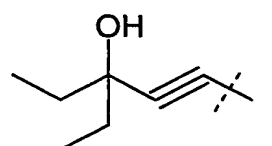
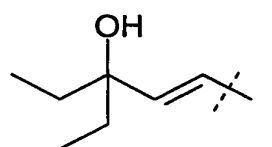
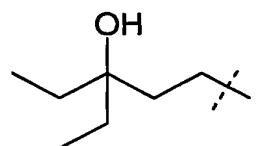
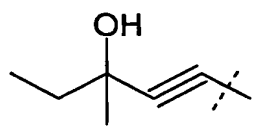
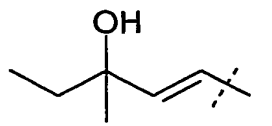
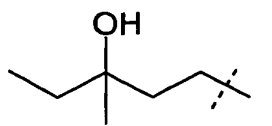
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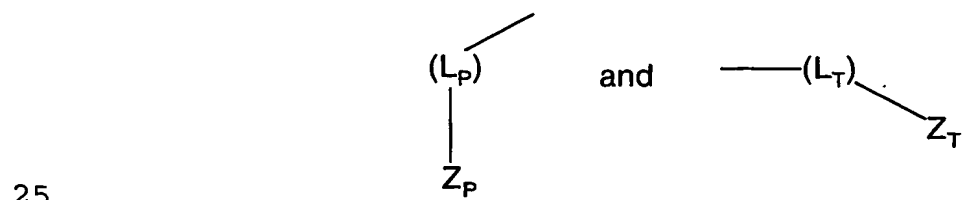
10

1-hydroxycyclopentenyl,
1-hydroxycyclohexenyl,

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1-hydroxycycloheptyl,
 1-hydroxycyclooctenyl,
 1-hydroxycyclopropyl,
 1-hydroxycyclobutyl,
 5 1-hydroxycyclopentyl,
 1-hydroxycyclohexyl,
 1-hydroxycycloheptyl,
 1-hydroxycyclooctyl,
 -5-tetrazolyl,
 10 -carboxyl,
 -OH,
 -I,
 -Br
 -Cl
 15 -F,
 -CHO,
 -NO₂,
 -CN,
 sulfonamide,
 20 sulfinamide,
 urethane-type radical, and
 (Acidic Group);

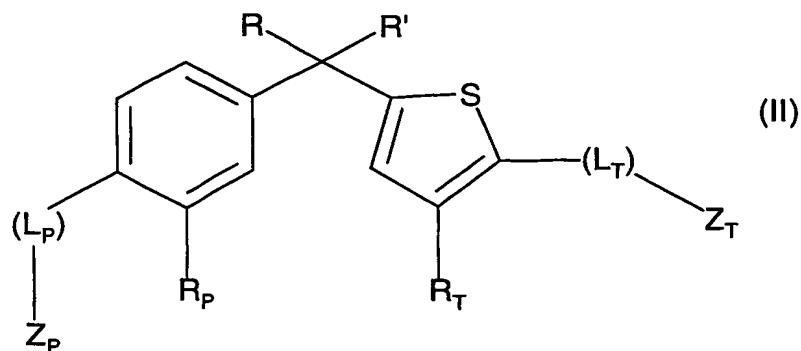
provided that the combined groups of formula I represented by



may both be lipophilic, or either one may be lipophilic and the other one polar; but both combined groups may not be polar.

Preferred compounds used in the method of the invention are represented by formula (II) or a pharmaceutically acceptable salt or prodrug derivative thereof:

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5 wherein;

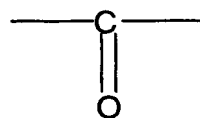
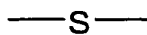
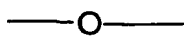
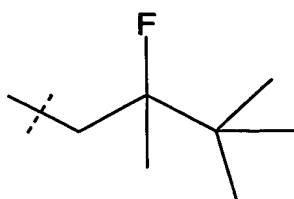
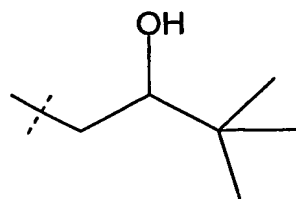
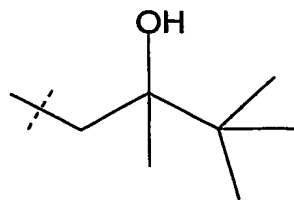
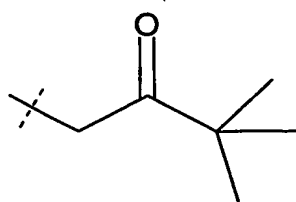
R and R' are independently methyl, ethyl, propyl, 1-methylethyl, 1-methylpropyl, 2-methylpropyl, or 1,1-dimethylethyl;

R_P and R_T are independently selected from the group consisting of hydrogen, fluoro, -CF₃, -CH₂F, -CHF₂, -CH₂Cl, methoxy, ethoxy, vinyl, methyl, ethyl, propyl, cyclopropyl, 1-methylethyl, butyl, 1-methylpropyl, 2-methylpropyl, or 1,1-dimethylethyl;

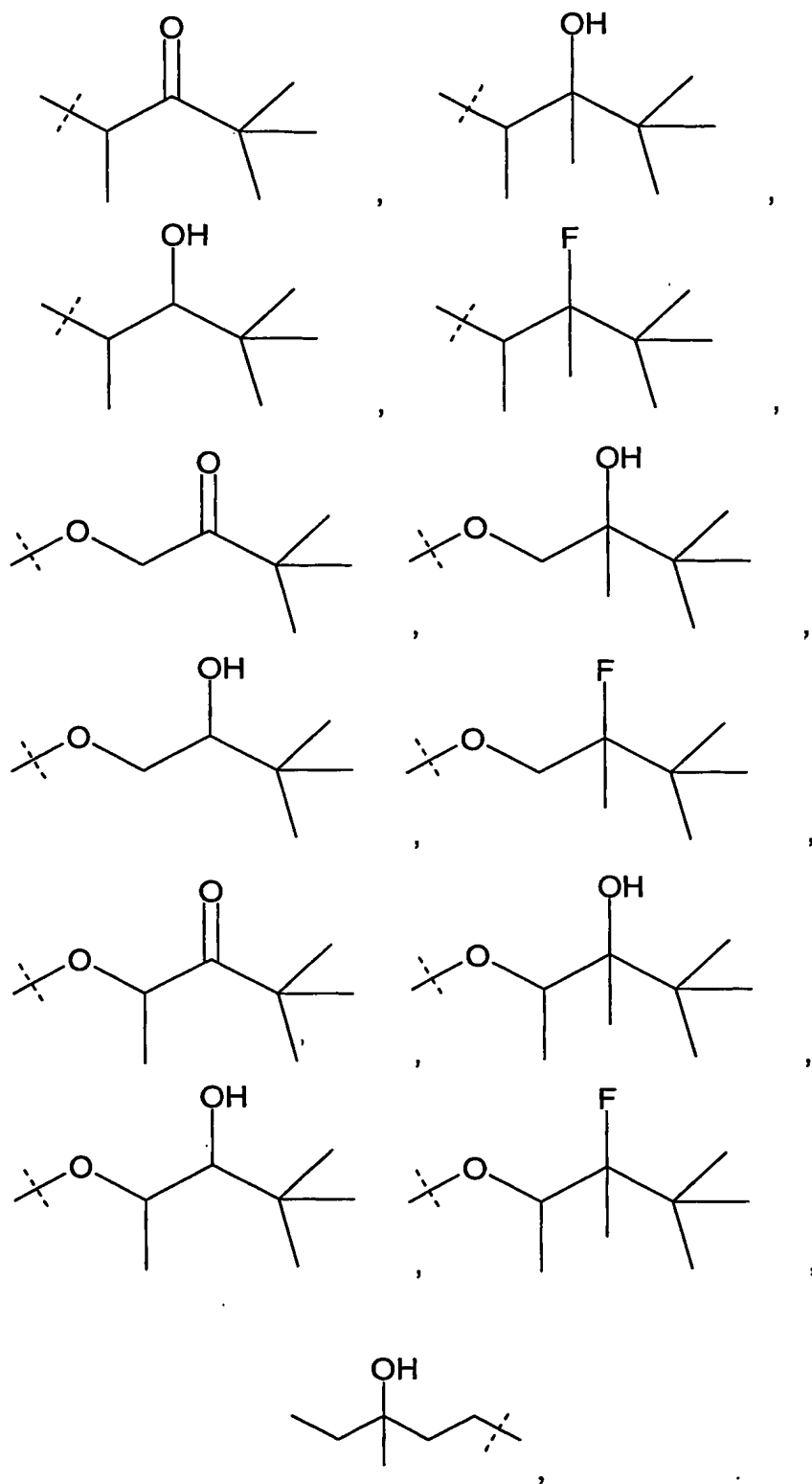
L_T and L_P are independently selected from one the following divalent linking group;

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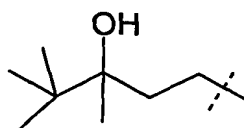
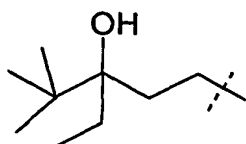
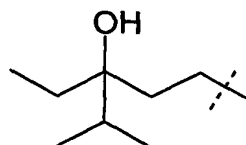
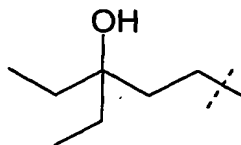
a bond

 Z_P is selected from

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1-hydroxycyclopentenyl,

1-hydroxycyclohexenyl,

1-hydroxycycloheptenyl,

1-hydroxycyclooctenyl,

1-hydroxycyclopropyl,

1-hydroxycyclobutyl,

1-hydroxycyclopentyl,

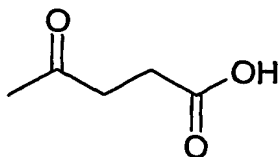
1-hydroxycyclohexyl,

1-hydroxycycloheptyl,

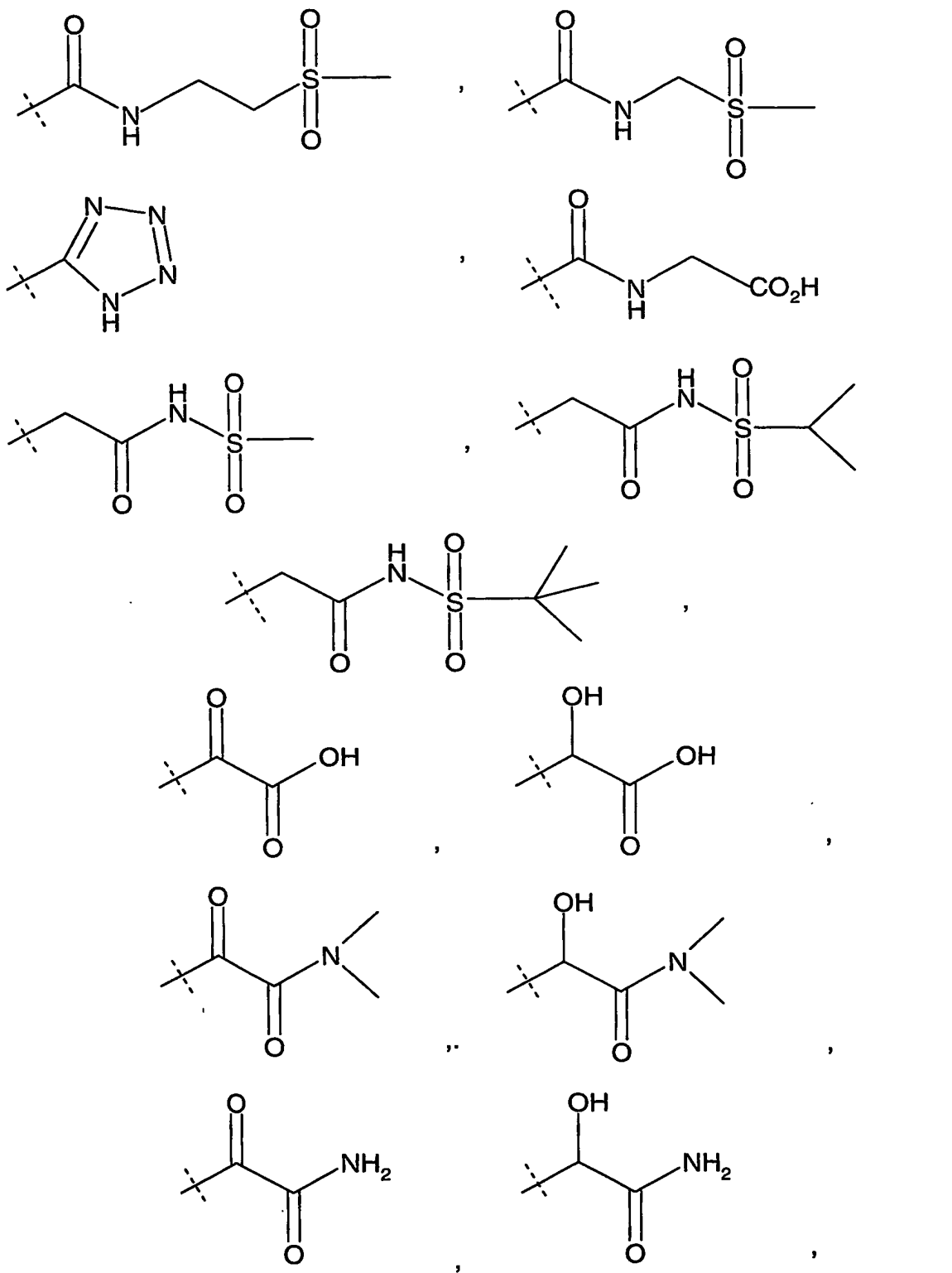
and

1-hydroxycyclooctyl.

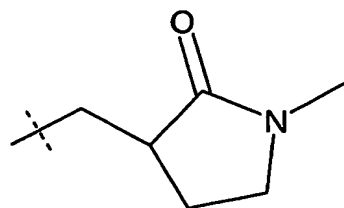
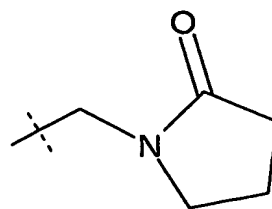
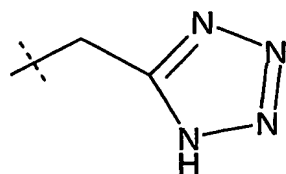
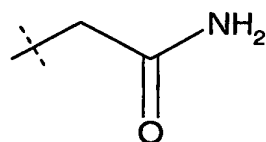
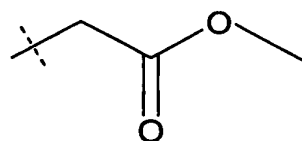
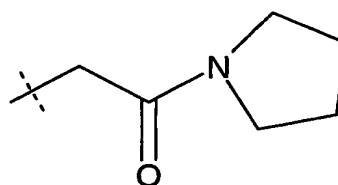
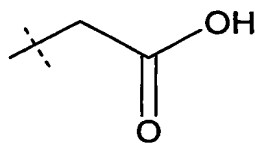
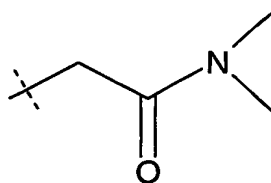
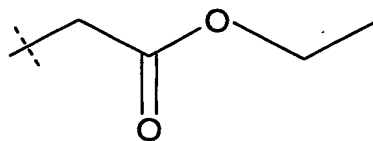
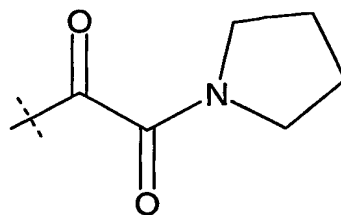
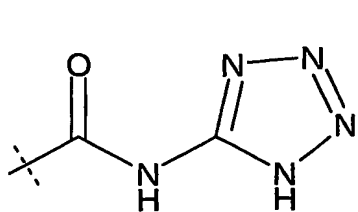
Z_T is a group represented by one of the structural formulae:



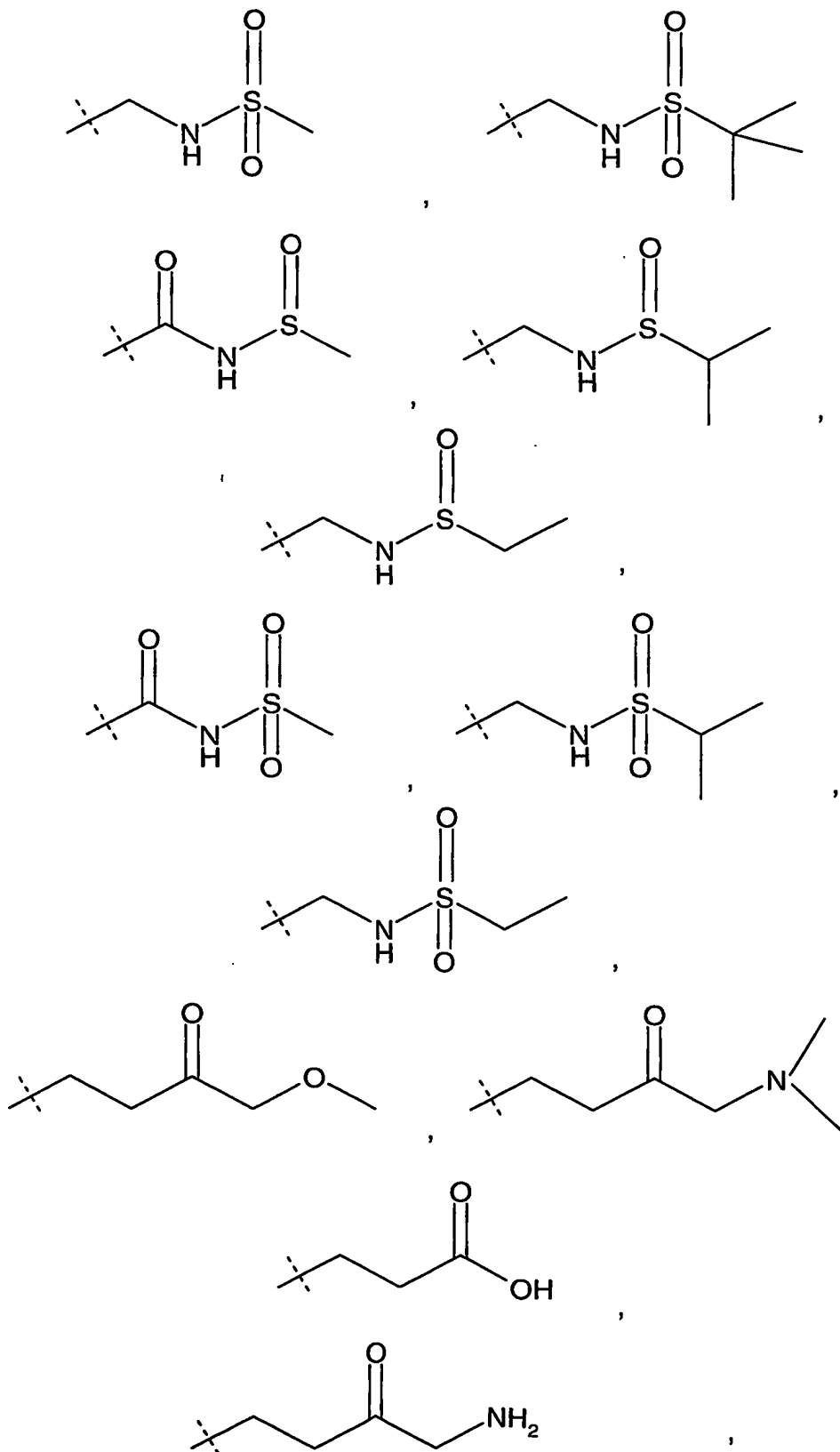
-44-



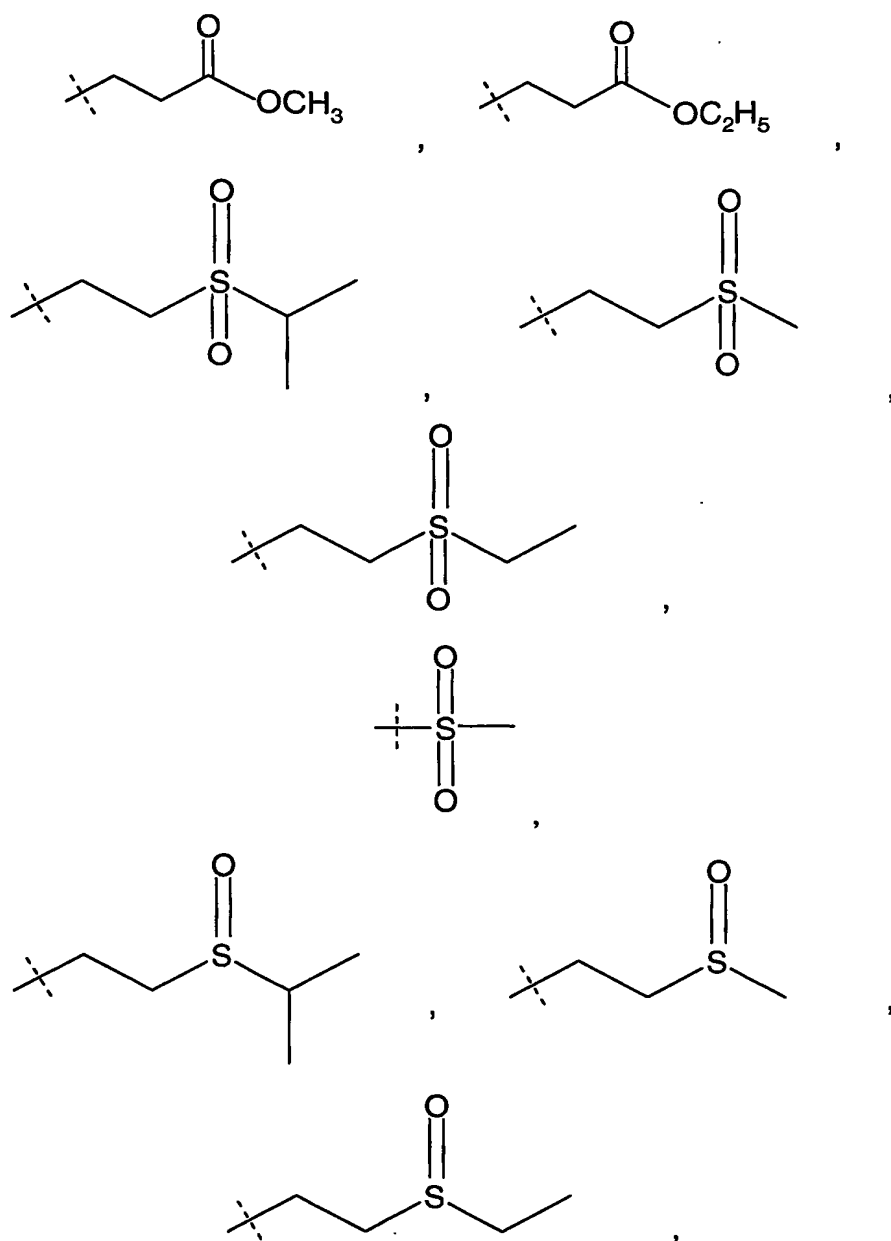
-45-

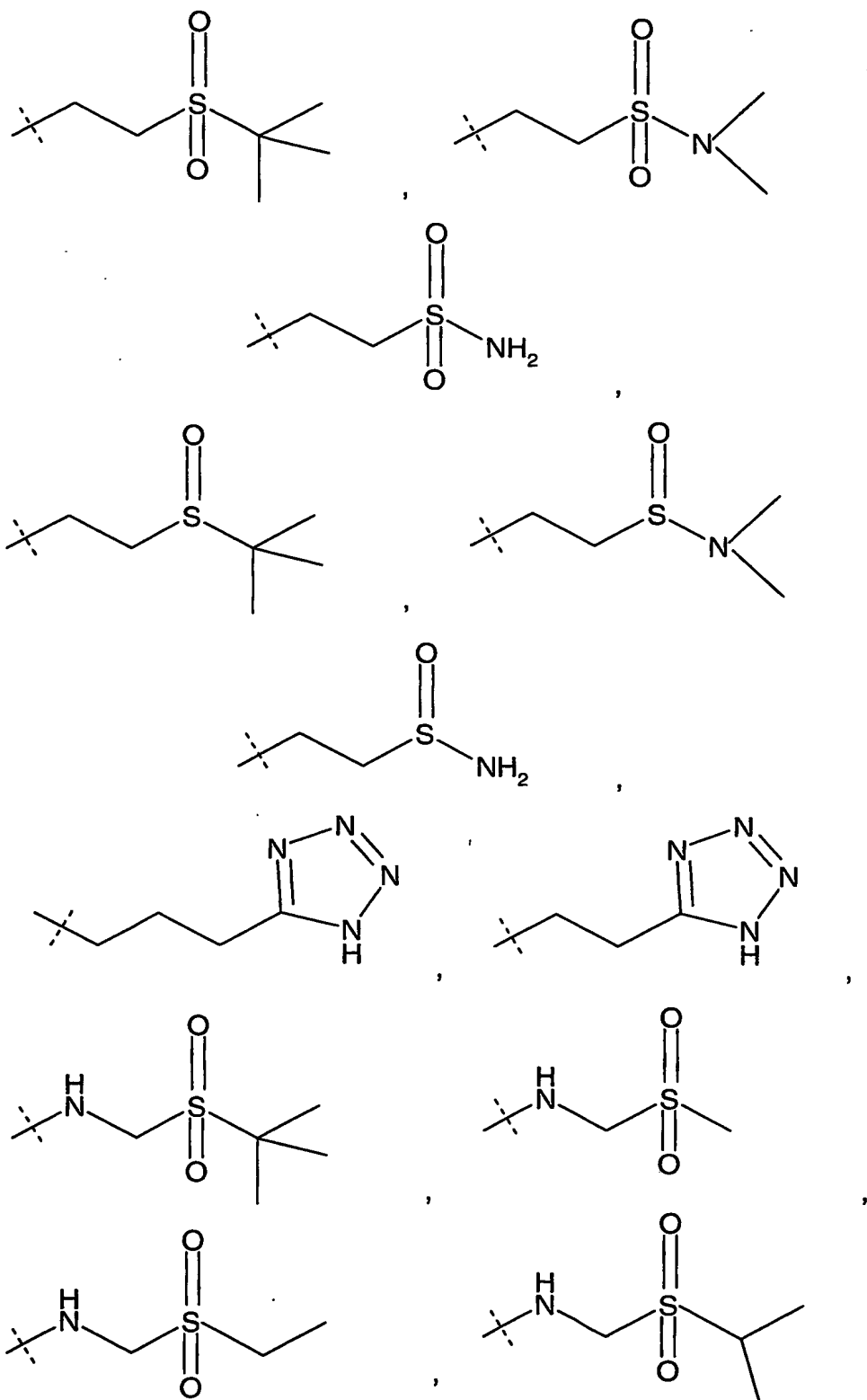


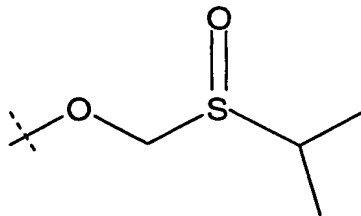
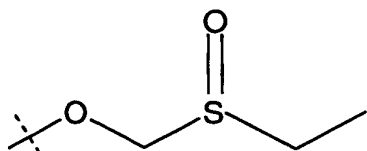
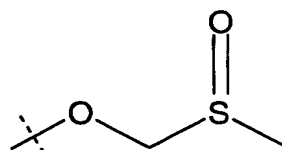
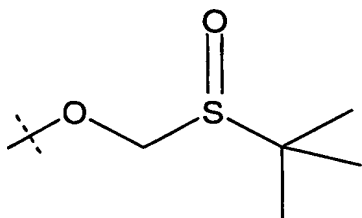
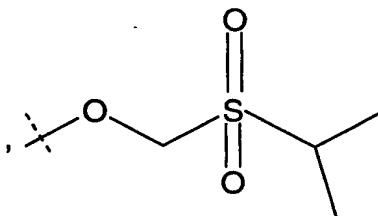
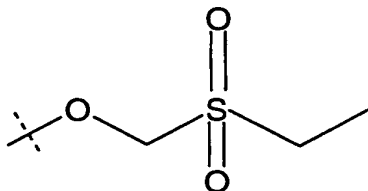
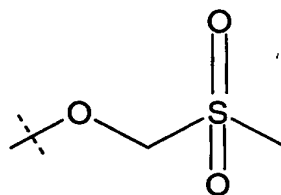
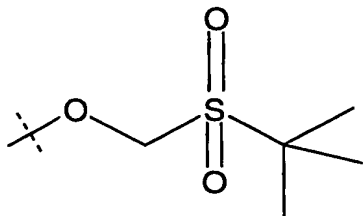
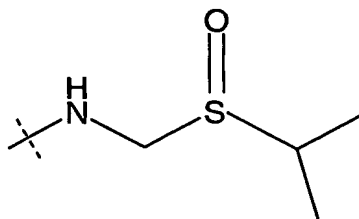
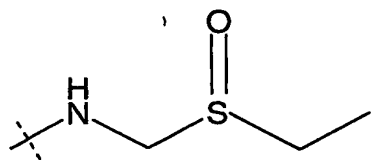
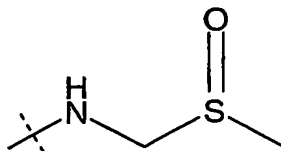
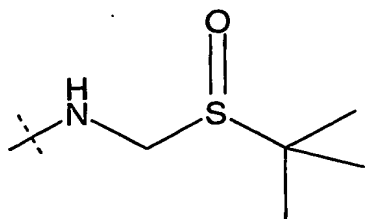
-46-

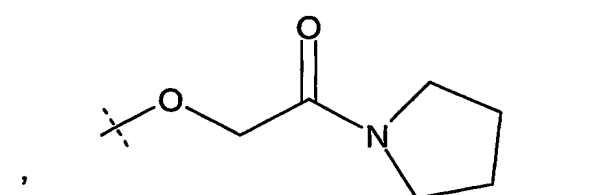
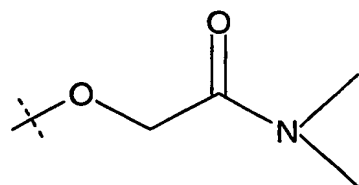
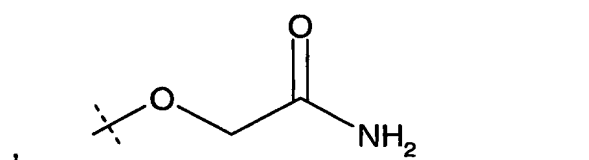
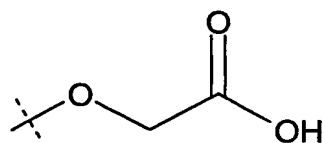
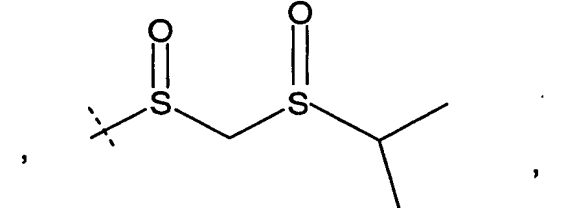
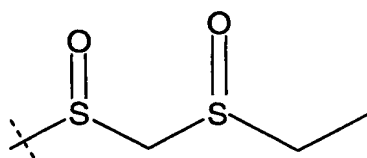
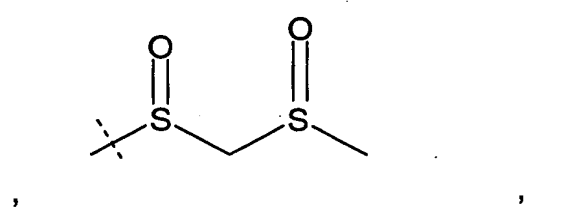
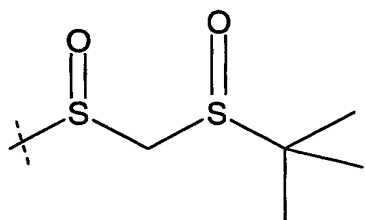
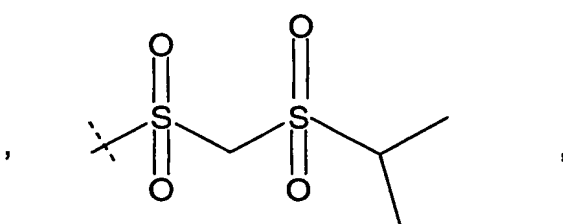
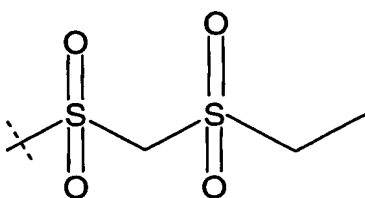
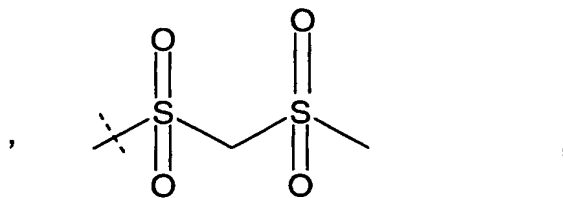
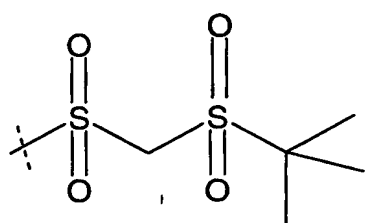


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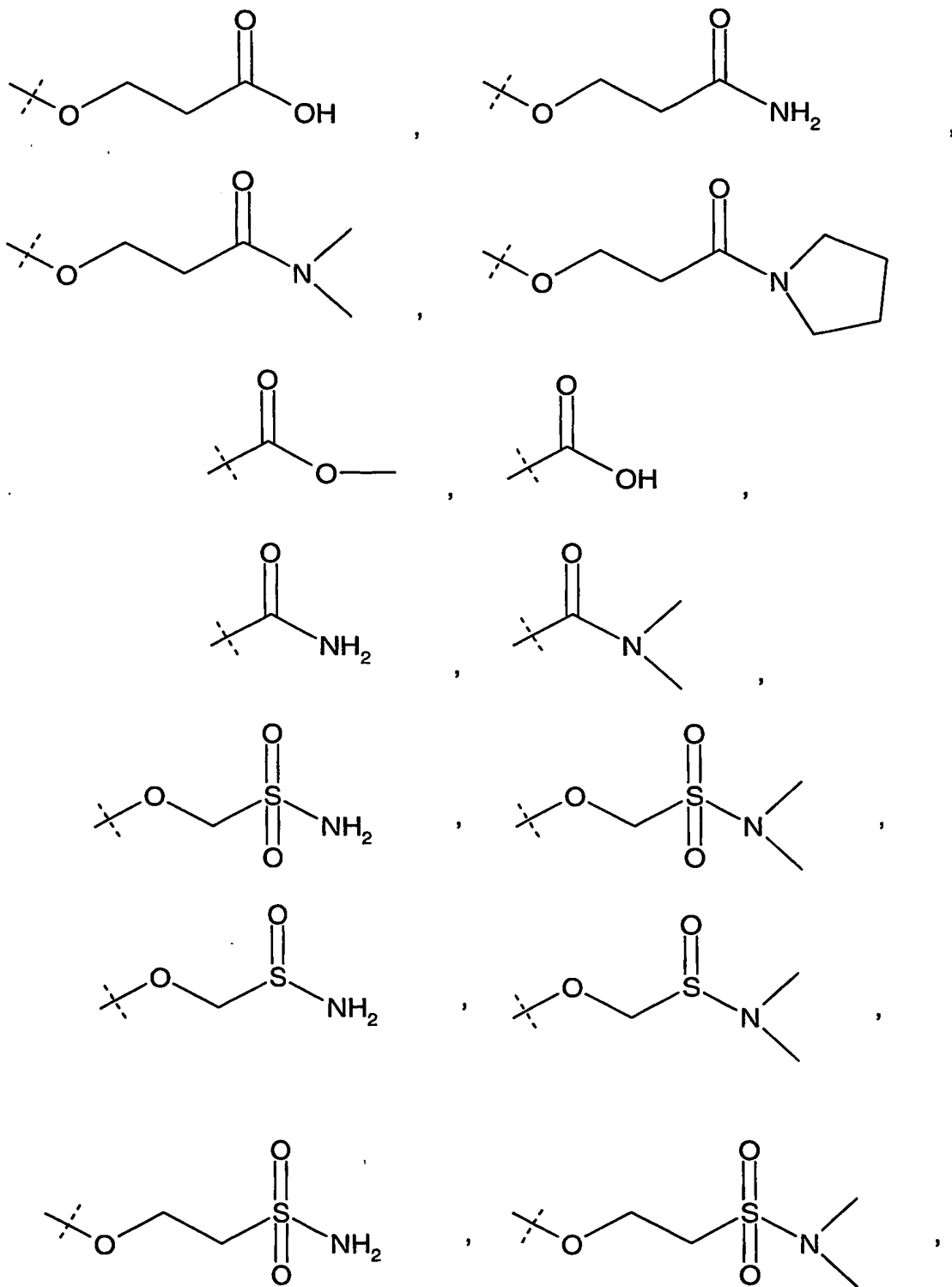


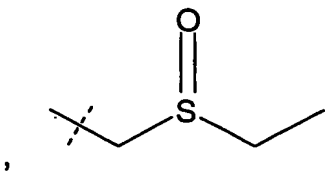
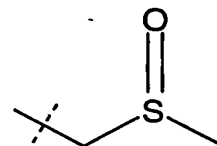
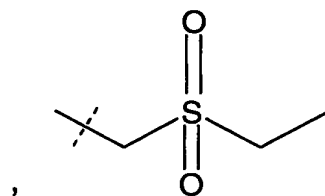
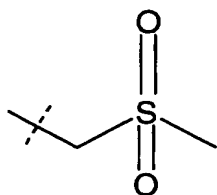
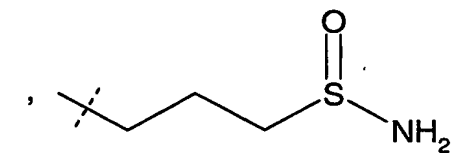
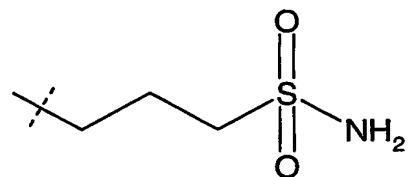
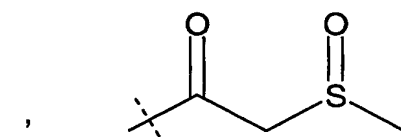
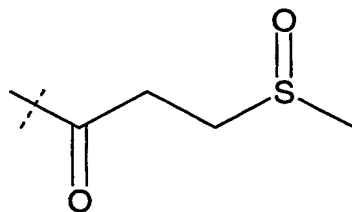
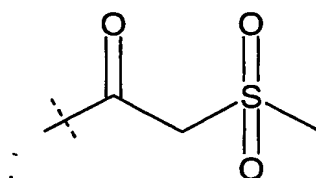
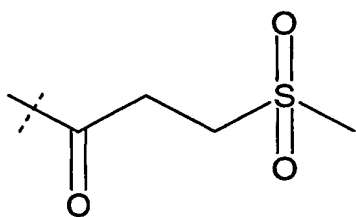
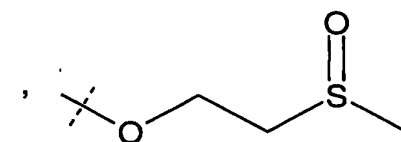
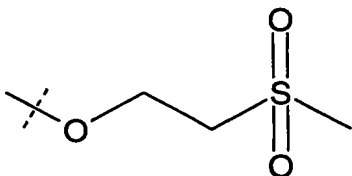
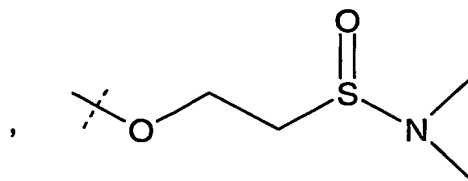
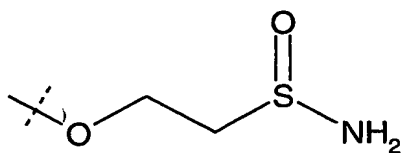




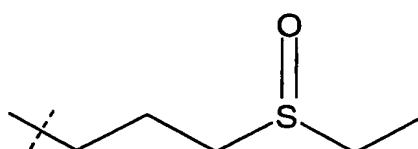
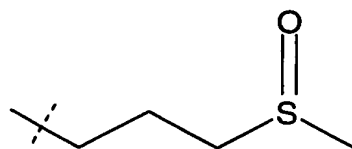
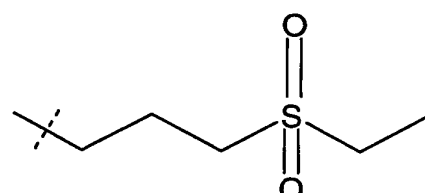
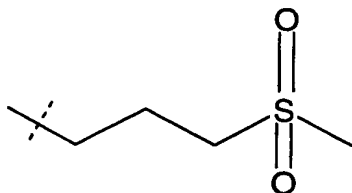
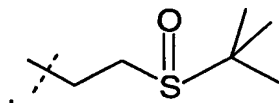
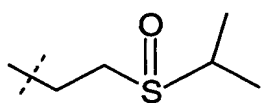
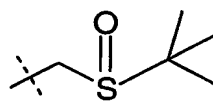
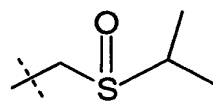
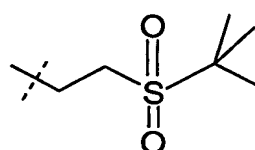
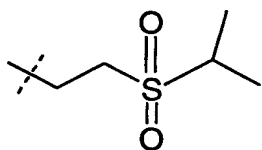
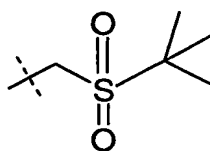
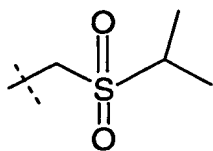
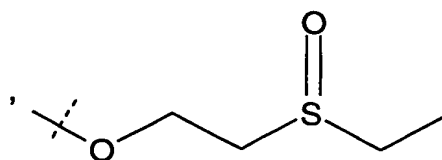
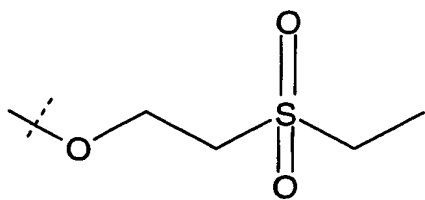


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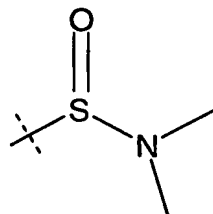
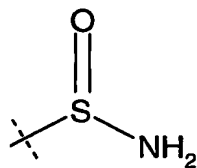
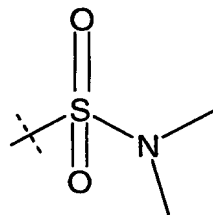
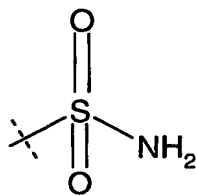
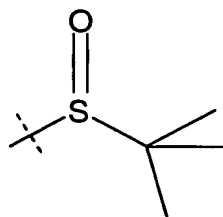
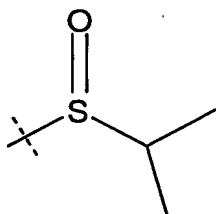
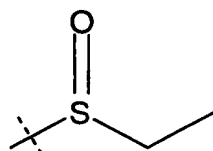
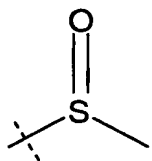
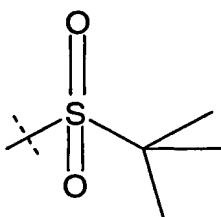
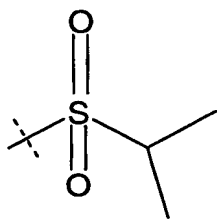
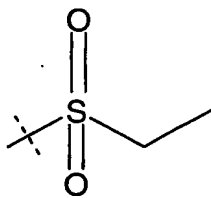
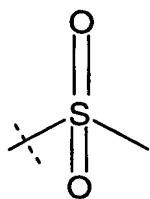




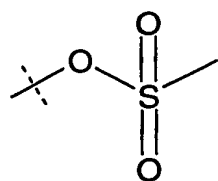
-53-



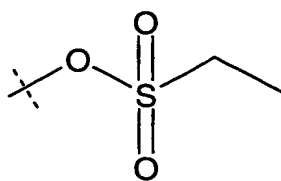
-54-



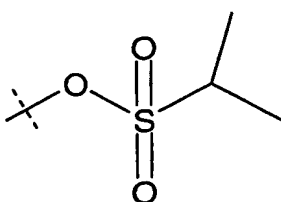
-55-



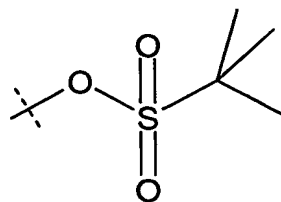
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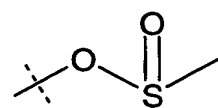
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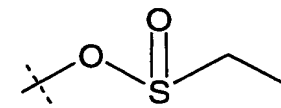
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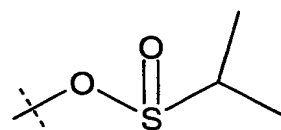
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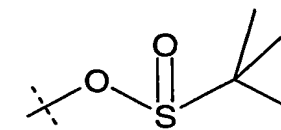
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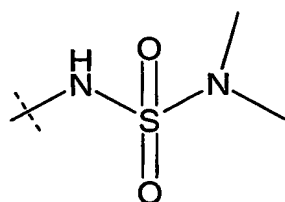
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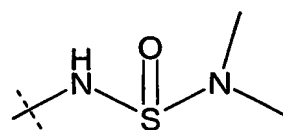
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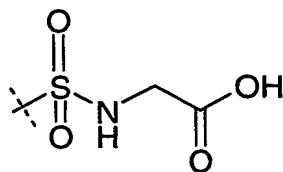
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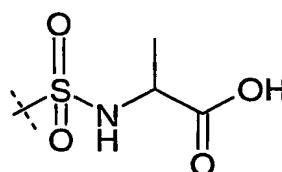
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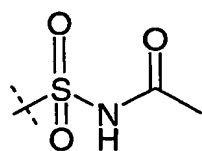
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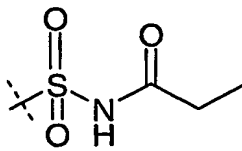
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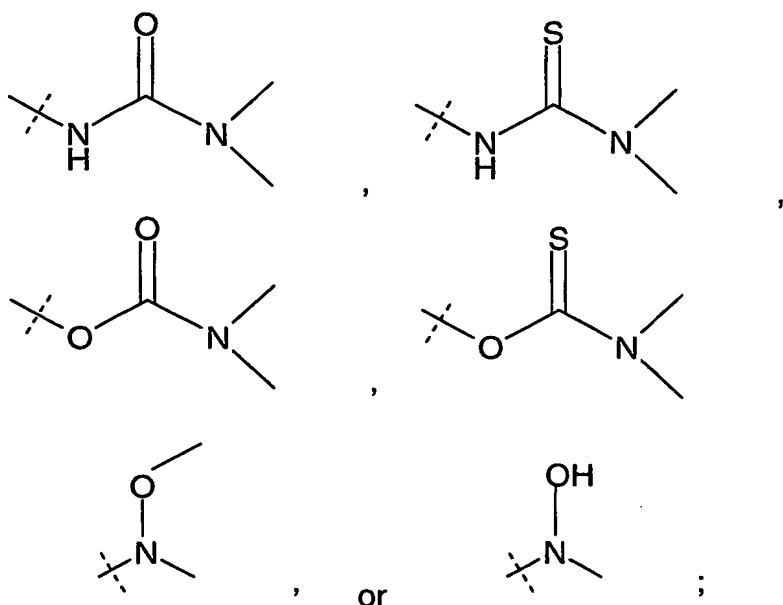


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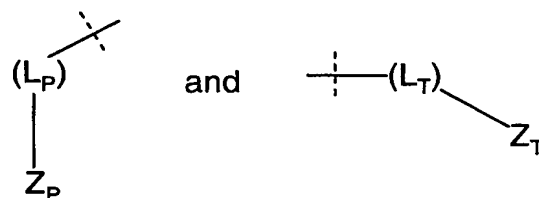


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-56-



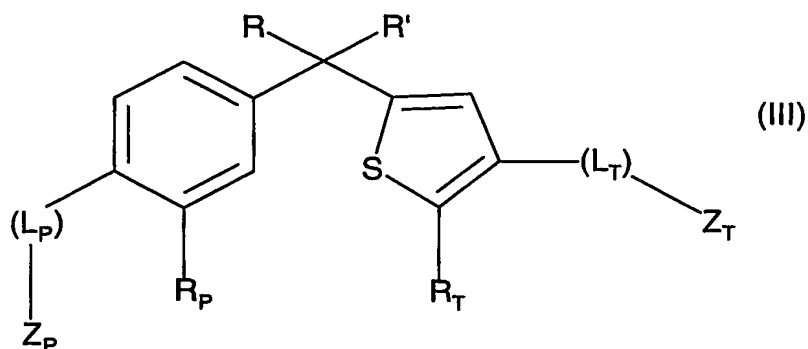
provided that the combined groups of formula I represented by



- 5 may both be lipophilic, or either one may be lipophilic and the other one polar; but both groups may not be polar.

Preferred compounds used in the method of the invention are also those represented by the formula III or a pharmaceutically acceptable salt or prodrug derivative thereof:

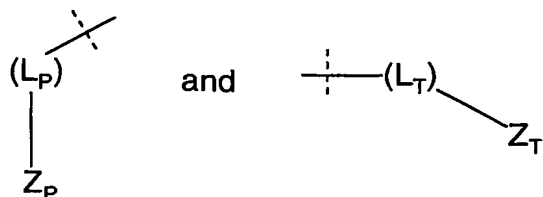
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wherein the substituents R, R', R_P, R_T, L_P, L_T, Z_P, and Z_T are the same as defined for

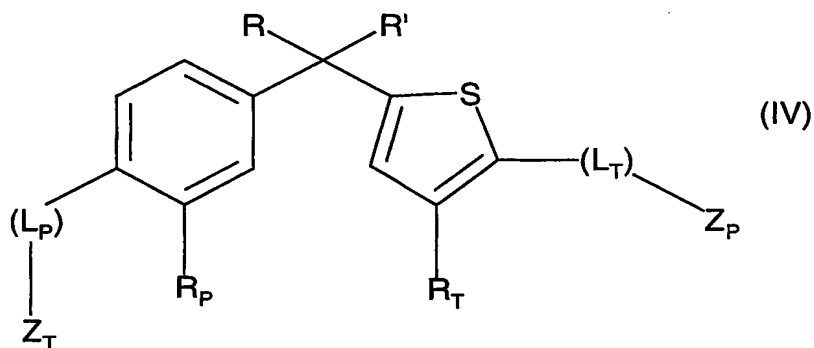
-57-

formula II, supra., provided that the combined groups of formula I represented by

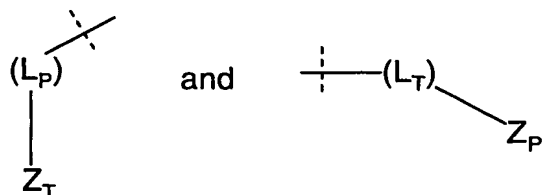


may both be lipophilic, or either one may be lipophilic and the other one polar; but both groups may not be polar.

- 5 Preferred compounds used in the method of the invention are also those represented by the formula IV or a pharmaceutically acceptable salt or prodrug derivative thereof:



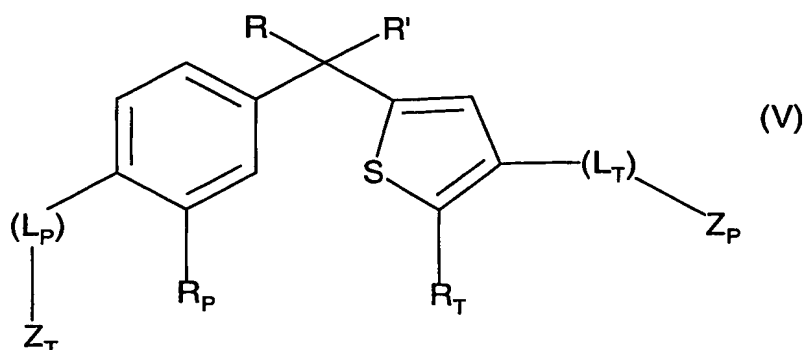
10 wherein the substituents R, R', R_P, R_T, L_P, L_T, Z_P, and Z_T are the same as defined for formula II, supra., provided that the combined groups of formula I represented by



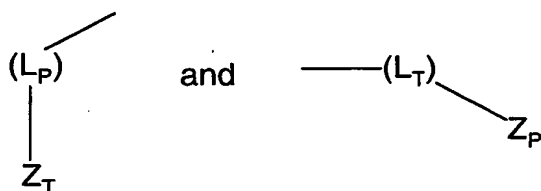
15 may both be lipophilic, or either one may be lipophilic and the other one polar; but both groups may not be polar.

Preferred compounds used in the method of the invention are also those represented by the formula V or a pharmaceutically acceptable salt or prodrug derivative thereof:

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wherein the substituents R, R', R_P, R_T, L_P, L_T, Z_P, and Z_T are the same as defined for formula II, supra., provided that the combined groups of formula I represented by



may both be lipophilic, or either one may be lipophilic and the other one polar; but both groups may not be polar.

Preferred Substituents of Compounds used in the Method of the Invention Represented by Formulae I, II, III, IV, and V:

Particularly preferred compounds of Formulae I thru V used in the method of the invention are those wherein the divalent linking group, -(L_T)- is a bond, -O-, or -CH₂-.

Particularly preferred compounds of Formulae I thru V are those wherein both R and R' are ethyl.

Particularly preferred compounds of Formulae I thru V are those wherein both R_P and R_T are methyl.

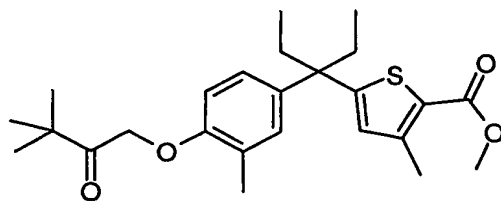
Particularly preferred salt forms of Formulae I thru V are the potassium or sodium salts.

A particularly preferred C₁-C₅ alkyl group where Z_P and/or Z_T contain such group is 1,1-dimethylethyl.

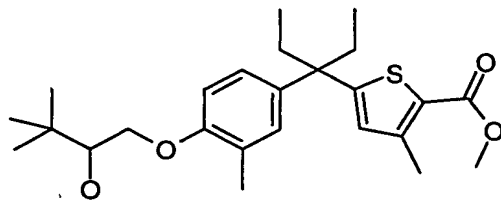
Preferred compounds in useful in practicing the therapeutic methods of the invention as shown in the structural formulae X1 to X188, as follows:

X1)

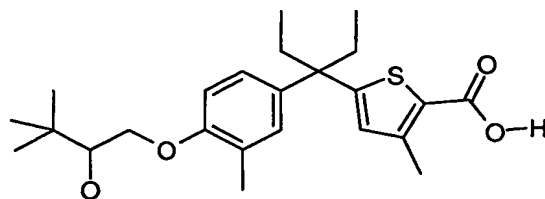
-59-



X2)

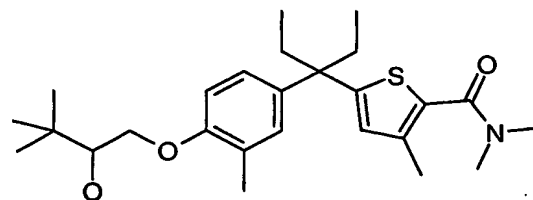


X3)

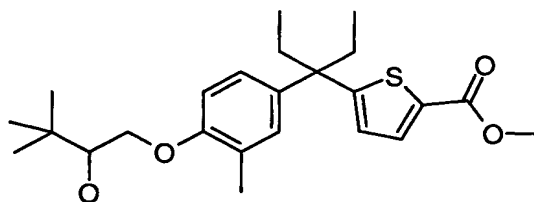


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X4)



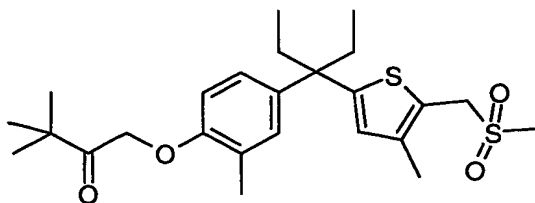
X5)



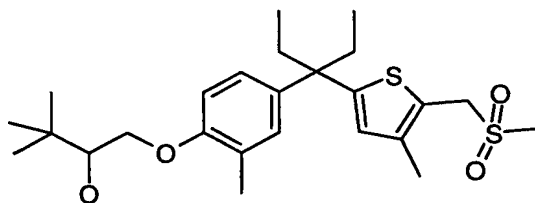
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-60-

X9)

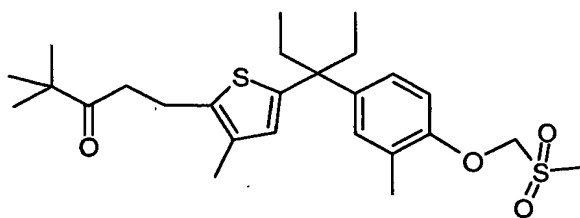


X10)

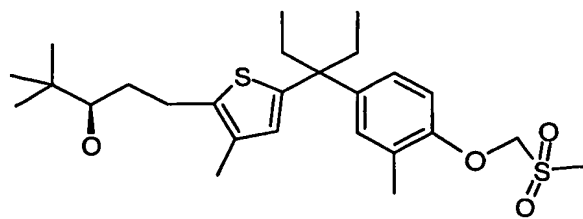


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10 X13)



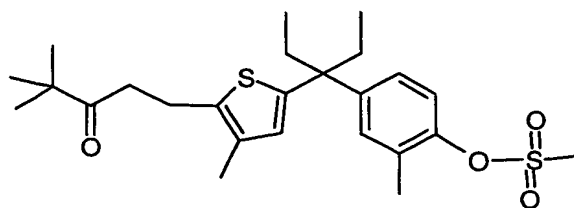
X14)



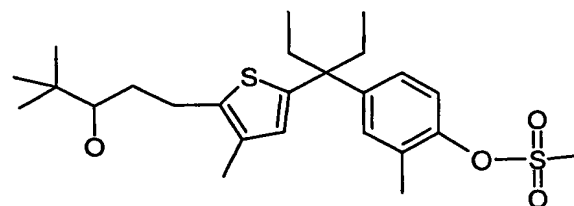
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-61-

X17)

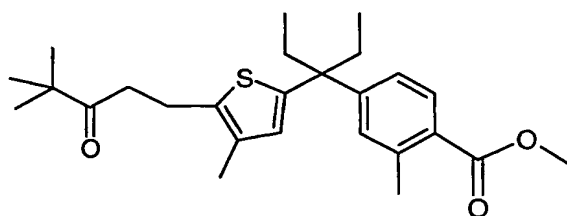


X19)

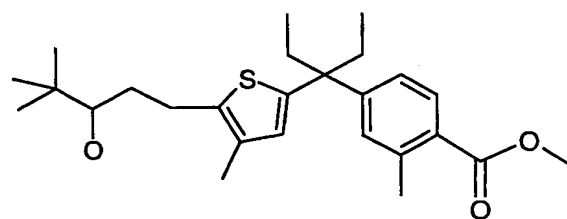


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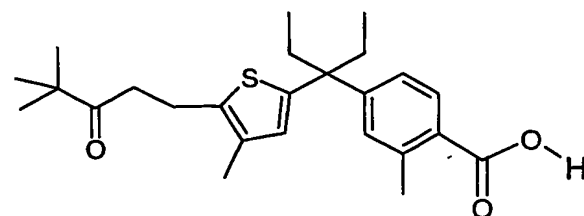
X20)



X21)

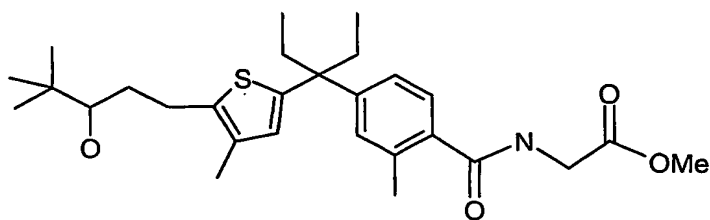


10 X22)

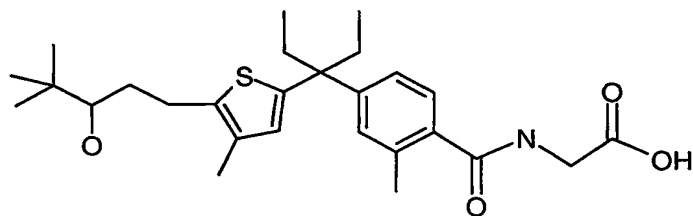


X24)

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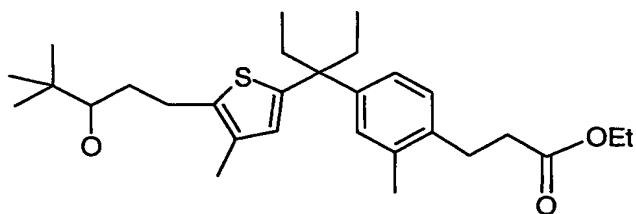


X26)

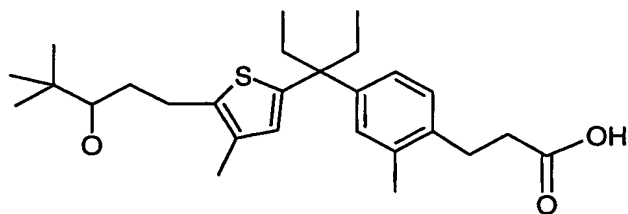


X28)

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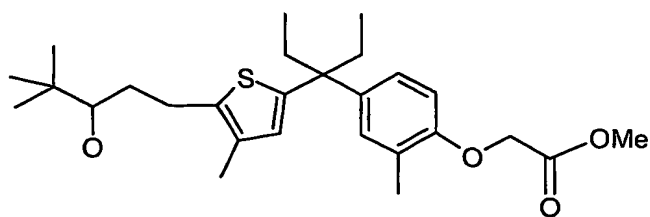
X29)



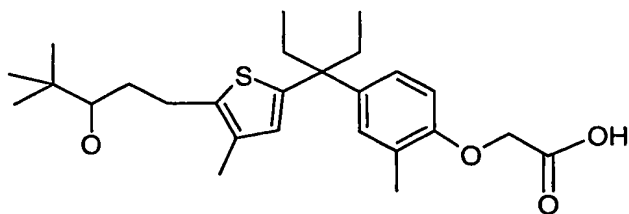
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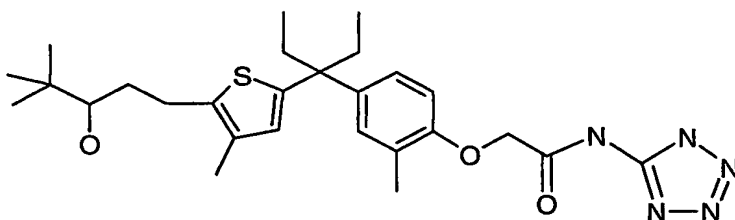
X31)



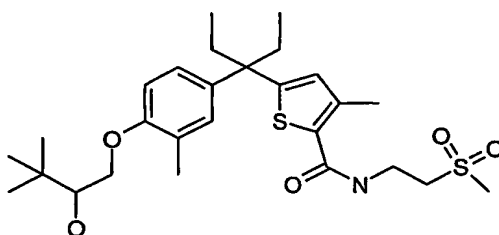
X32)



5 X34)



X38)

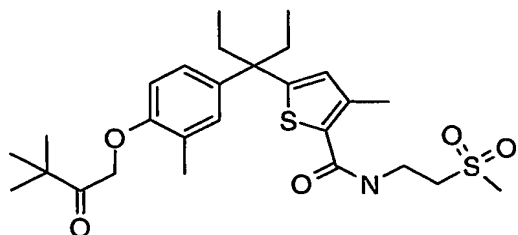


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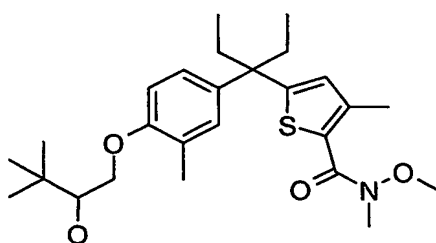
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-64-

X41)

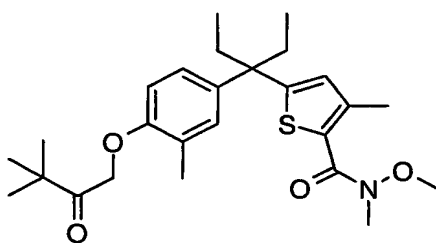


X42)

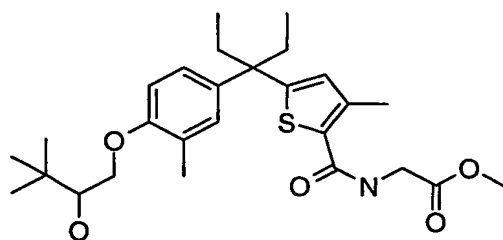


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X45)



X46)

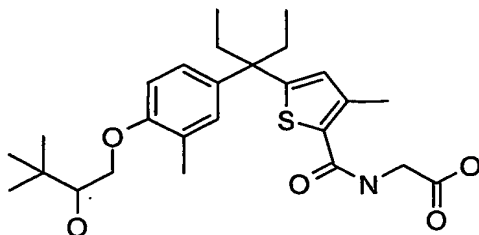


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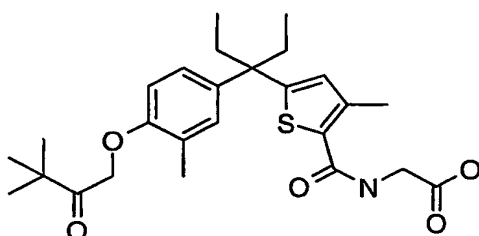
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-65-

X47)

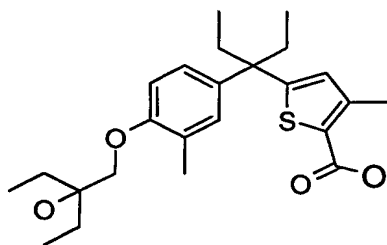


X50)

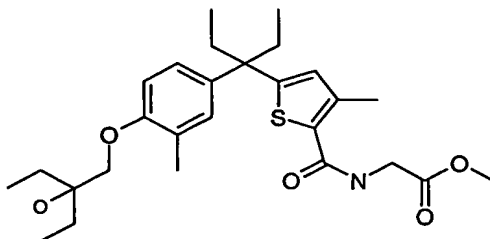


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X51)



X52)

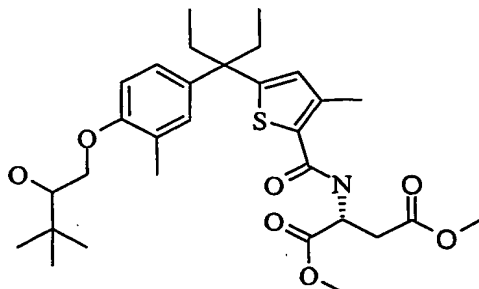


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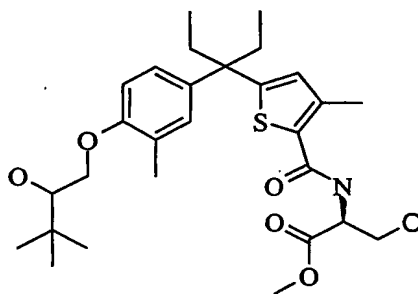
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-67-

X60)

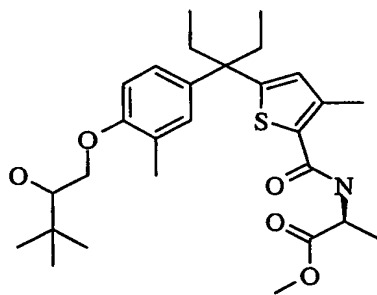


X62)

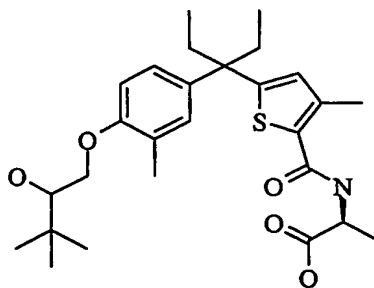


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X64)



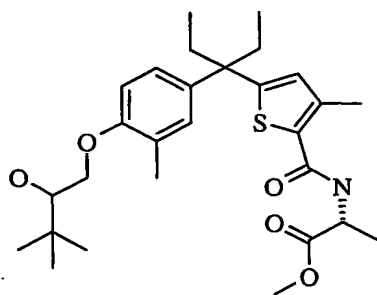
X65)



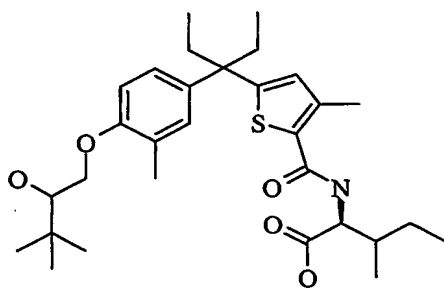
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-68-

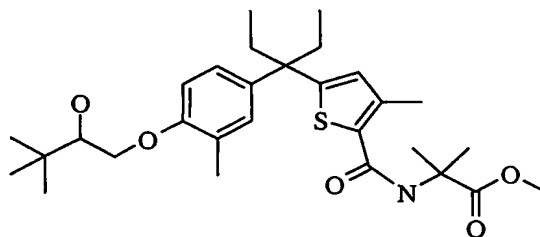
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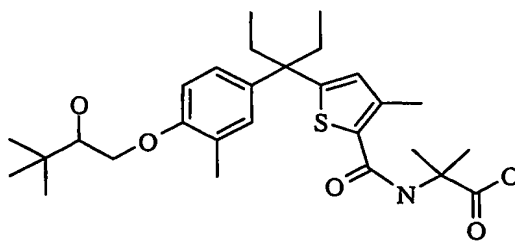
X69)



5 X70)

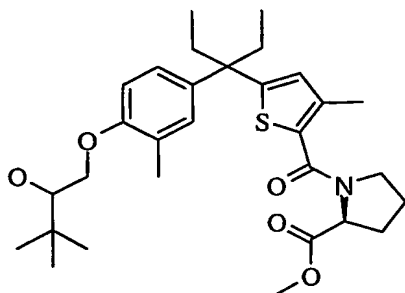


X71)

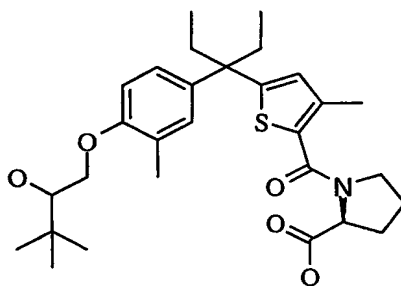


-69-

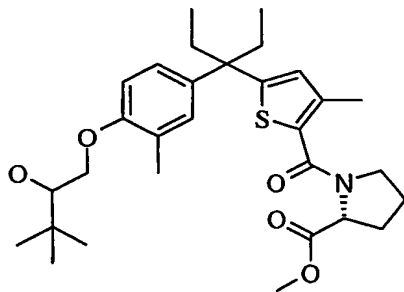
X72)



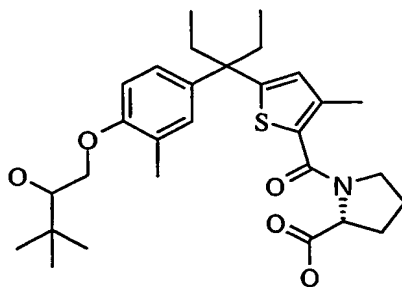
X75)



5 X78)

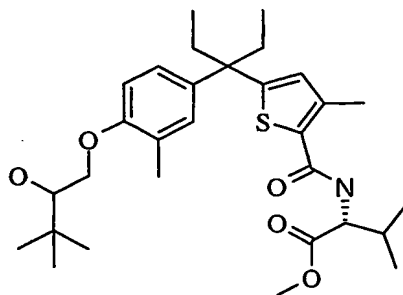


X81)

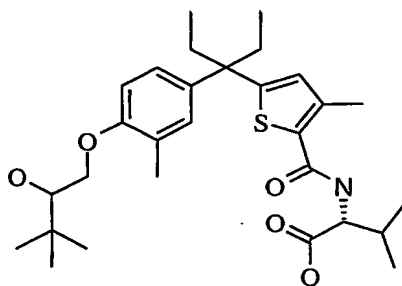


-70-

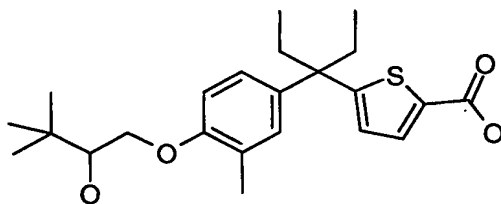
X83)



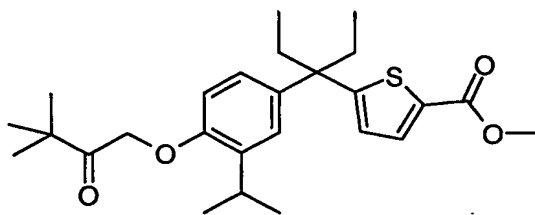
5 X86)



X88)

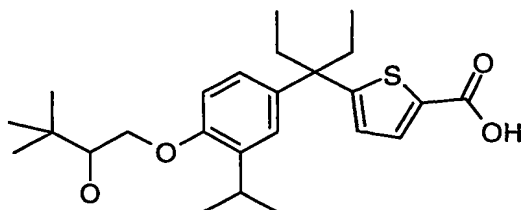


10 X91)

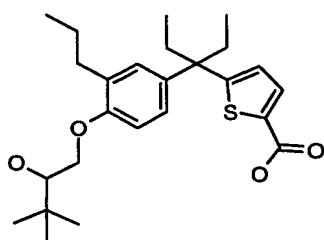


-71-

X92)

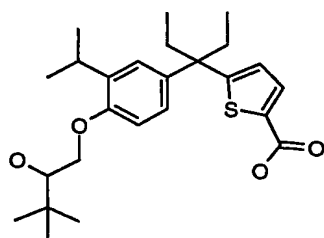


X93)

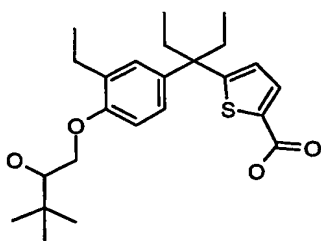


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X96)



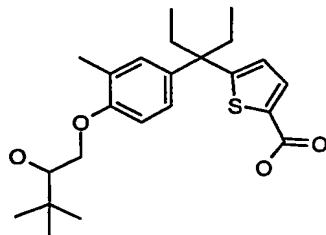
X99)



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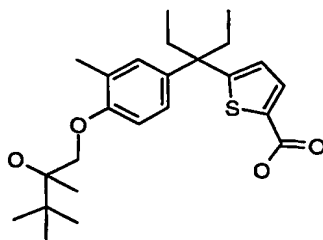
-72-

X102)

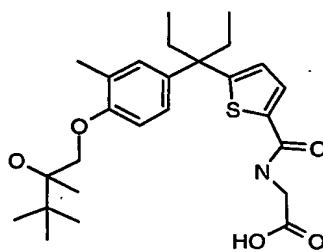


-73-

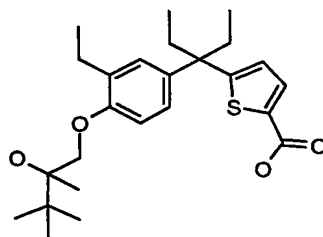
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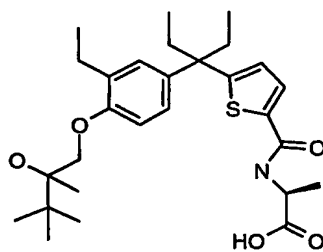
5 X106)



X107)



X110)

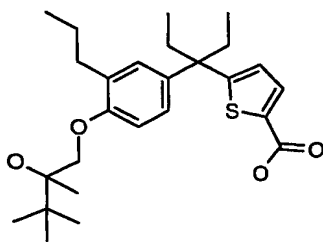


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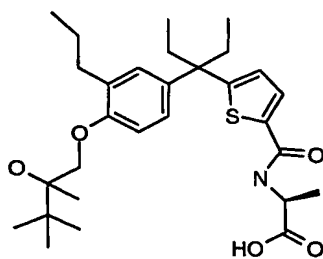
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-74-

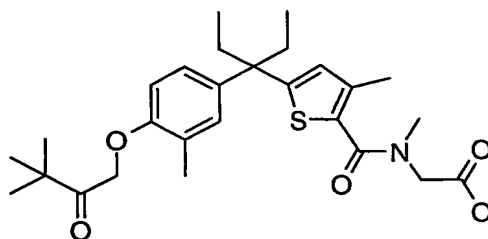
X111)



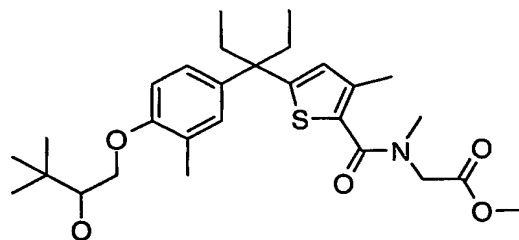
X114)



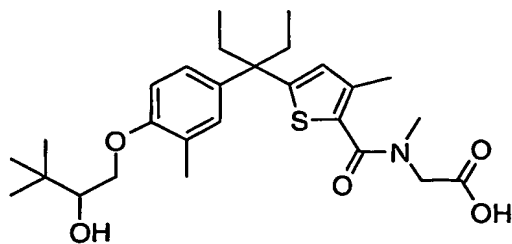
5 X118)



X119)

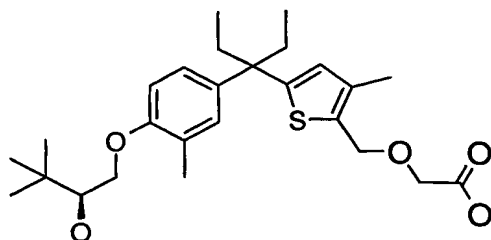


10 X122)



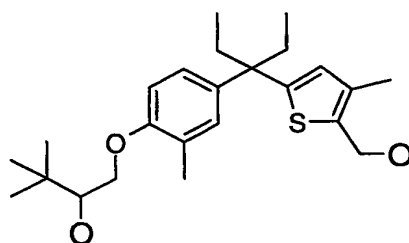
-75-

X124)

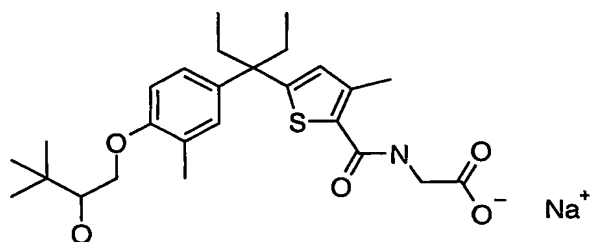


X125)

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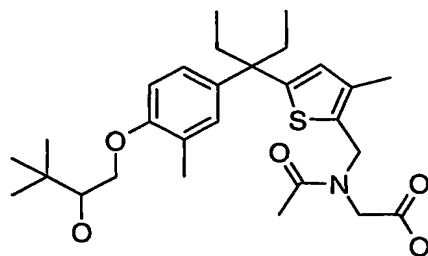


X128)



X130)

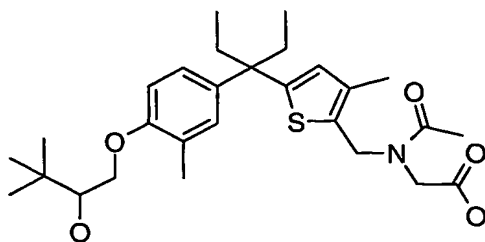
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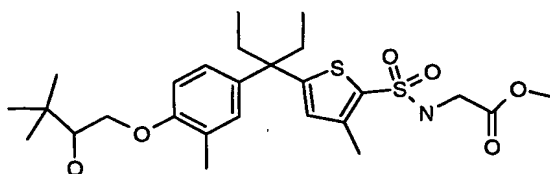
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-76-

X131)

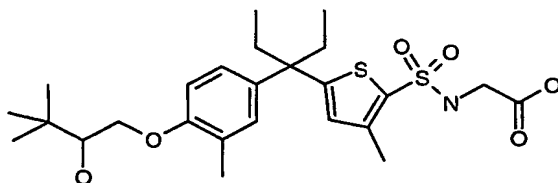


X134)

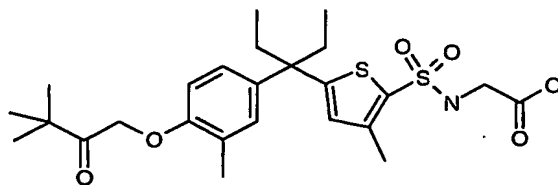


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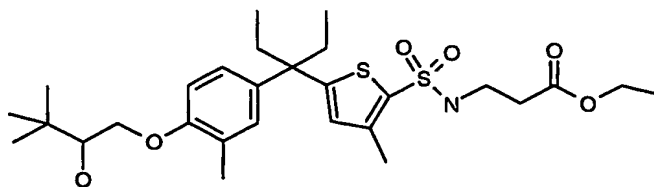
X137)



10 X139)



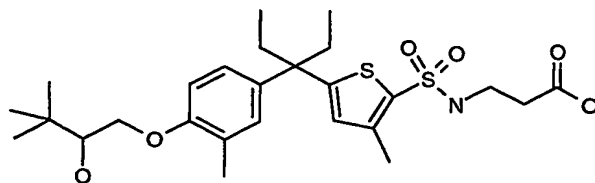
X140)



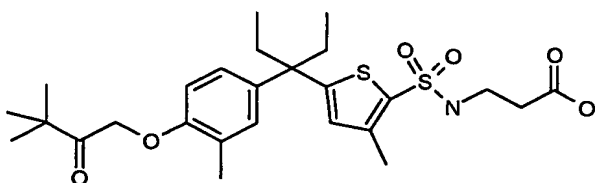
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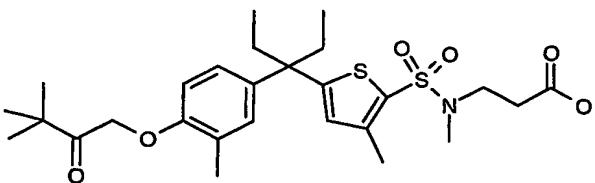
X141)



5 X144)

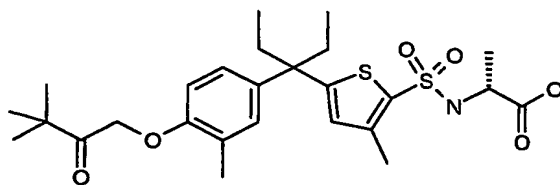


X145)

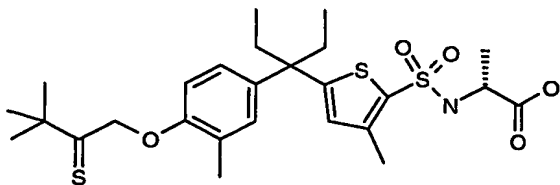


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X146)



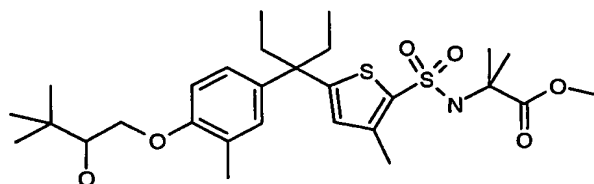
X147)



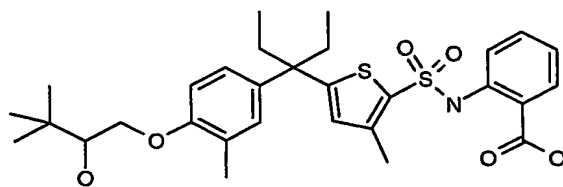
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X148)

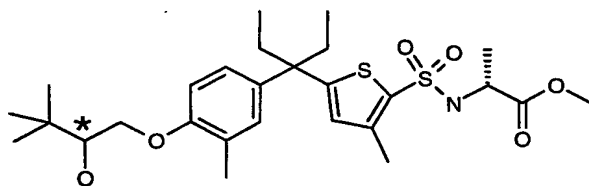


X149)

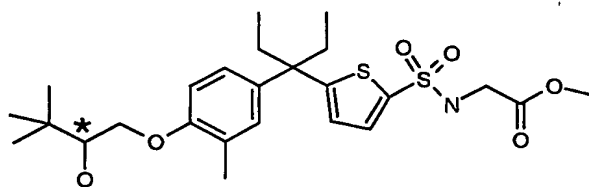


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X150)

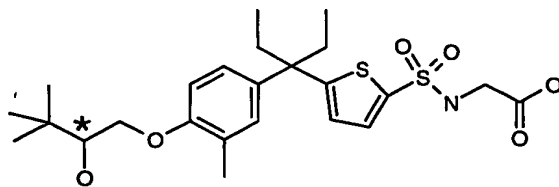


X152)



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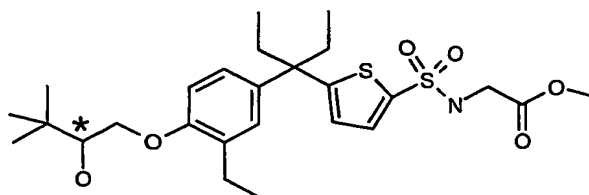
X153)



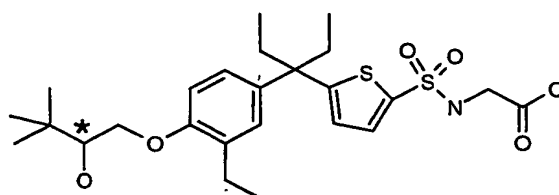
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X154)

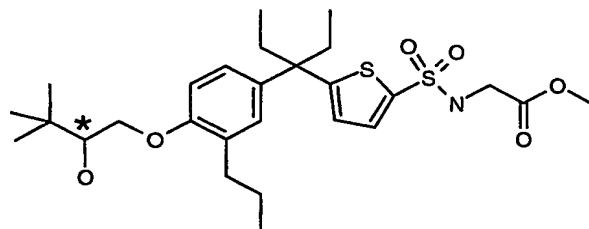


X155)

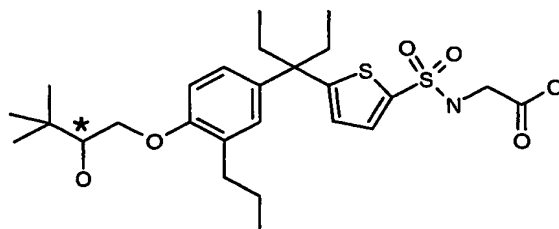


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X156)

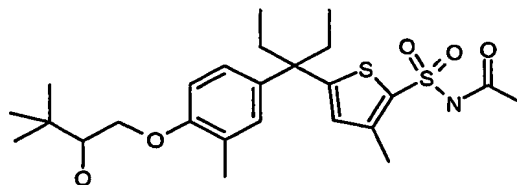


X157)



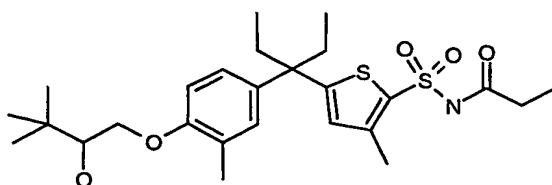
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X158)

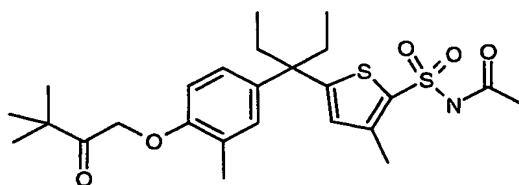


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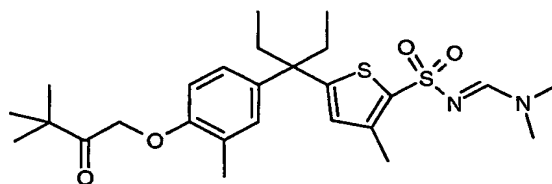
X159)



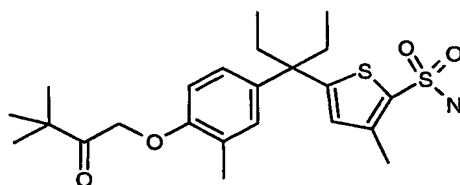
5 X160)



X161)

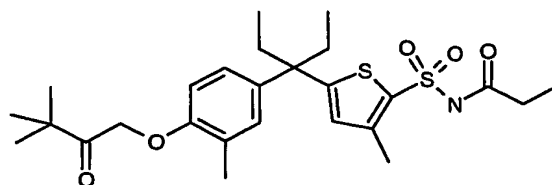


X162)



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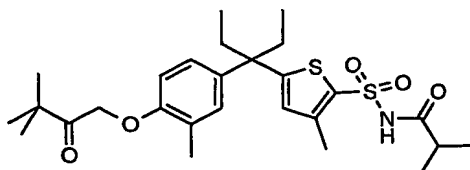
X163)



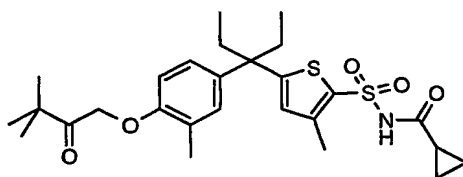
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X164)

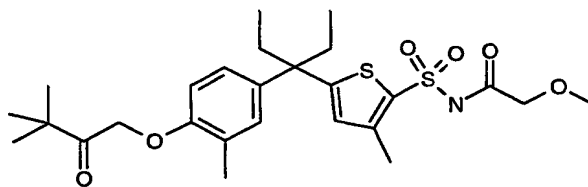


X165)

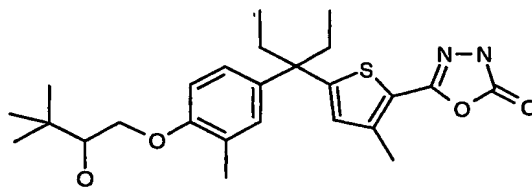


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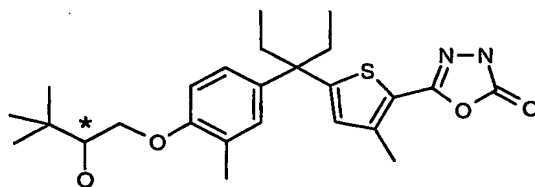
X166)



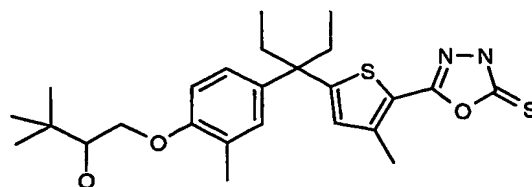
X169)



10 X171)

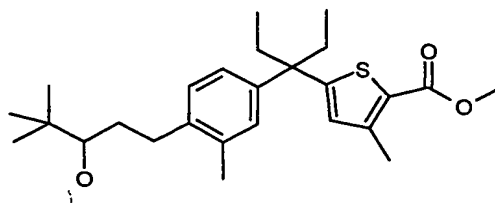


X172)



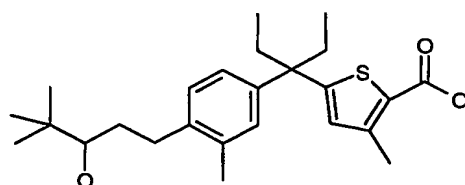
-82-

X174)

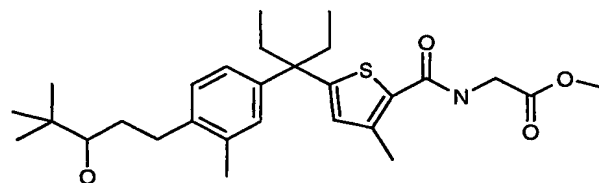


X175)

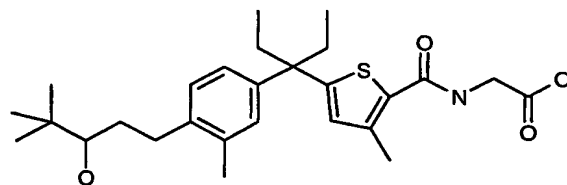
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X176)

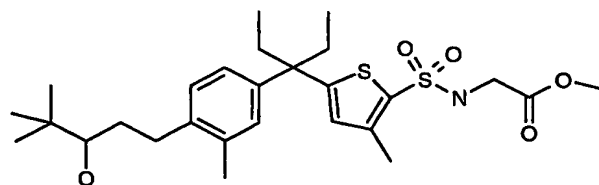


X177)



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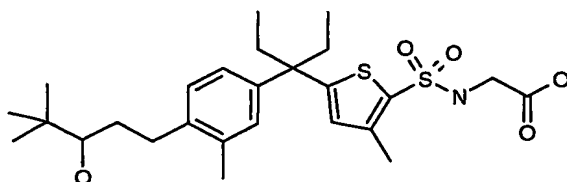
X178)



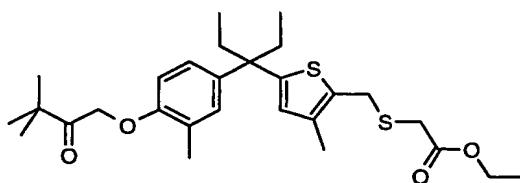
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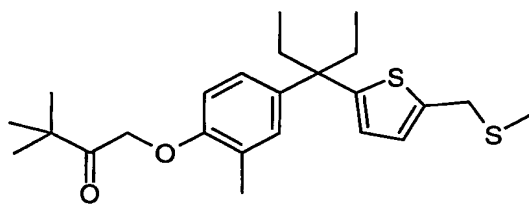
X179)



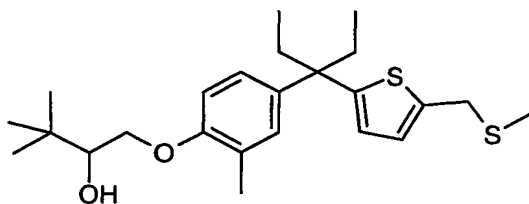
X183)



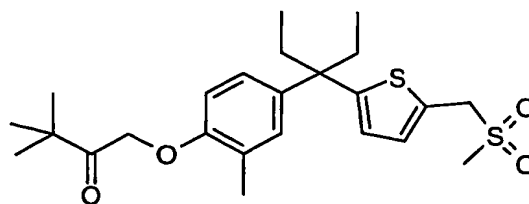
5 X184)



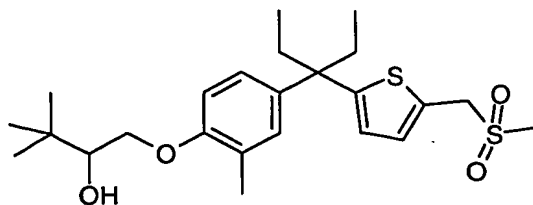
X185)



10 X187)



X188)



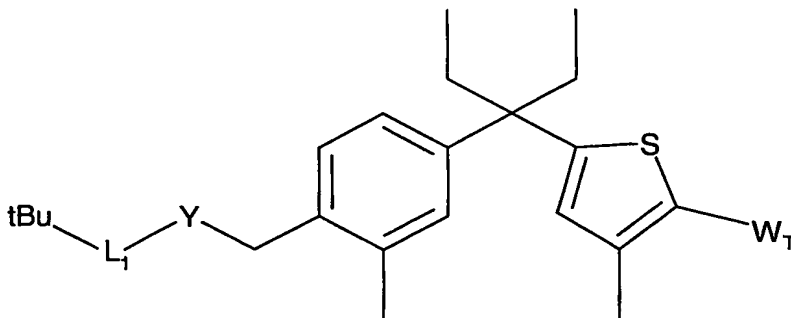
5

Other specific compounds that are preferred embodiments for practicing the method of treatment of the invention are set out in the following four Tables. All numbers in the Tables cells reciting chemical species are subscripts, for example, in row, Code 11, Column, W_T , the symbol, "CO₂H" is to be understood as the conventional chemical nomenclature, -- CO₂H --. Each row of Tables 1, 2, 3, and 4 is a single compound having an identifying "Code" (e.g., "206", "318A") defining the specific substituents in the structural formula displayed above the Tables, as follows:

10

Table 1

15



Code	L_1	Y	W_T
1	C(O)	CH ₂	-CO ₂ Me
2	CHOH	CH ₂	-CO ₂ Me
3	C(Me)OH	CH ₂	-CO ₂ Me
4	C(O)	CH(Me)	-CO ₂ Me
5	CHOH	CH(Me)	-CO ₂ Me
6	C(Me)OH	CH(Me)	-CO ₂ Me

7	C(O)	CH ₂	-CO ₂ H
8	CHOH	CH ₂	-CO ₂ H
9	C(Me)OH	CH ₂	-CO ₂ H
10	C(O)	CH(Me)	-CO ₂ H
11	CHOH	CH(Me)	-CO ₂ H
12	C(Me)OH	CH(Me)	-CO ₂ H
13	C(O)	CH ₂	-C(O)NH ₂
14	CHOH	CH ₂	-C(O)NH ₂
15	C(Me)OH	CH ₂	-C(O)NH ₂
16	C(O)	CH(Me)	-C(O)NH ₂
17	CHOH	CH(Me)	-C(O)NH ₂
18	C(Me)OH	CH(Me)	-C(O)NH ₂
19	C(O)	CH ₂	-C(O)NMe ₂
20	CHOH	CH ₂	-C(O)NMe ₂
21	C(Me)OH	CH ₂	-C(O)NMe ₂
22	C(O)	CH(Me)	-C(O)NMe ₂
23	CHOH	CH(Me)	-C(O)NMe ₂
24	C(Me)OH	CH(Me)	-C(O)NMe ₂
25	C(O)	CH ₂	5-tetrazolyl
26	CHOH	CH ₂	5-tetrazolyl
27	C(Me)OH	CH ₂	5-tetrazolyl
28	C(O)	CH(Me)	5-tetrazolyl
29	CHOH	CH(Me)	5-tetrazolyl
30	C(Me)OH	CH(Me)	5-tetrazolyl
31	C(O)	CH ₂	-C(O)-NH-5-tetrazolyl
32	CHOH	CH ₂	-C(O)-NH-5-tetrazolyl
33	C(Me)OH	CH ₂	-C(O)-NH-5-tetrazolyl
34	C(O)	CH(Me)	-C(O)-NH-5-tetrazolyl
35	CHOH	CH(Me)	-C(O)-NH-5-tetrazolyl
36	C(Me)OH	CH(Me)	-C(O)-NH-5-tetrazolyl
37	C(O)	CH ₂	-C(O)NHCH ₂ SO ₂ Me

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38	CHOH	CH ₂	-C(O)NHCH ₂ SO ₂ Me
39	C(Me)OH	CH ₂	-C(O)NHCH ₂ SO ₂ Me
40	C(O)	CH(Me)	-C(O)NHCH ₂ SO ₂ Me
41	CHOH	CH(Me)	-C(O)NHCH ₂ SO ₂ Me
42	C(Me)OH	CH(Me)	-C(O)NHCH ₂ SO ₂ Me
43	C(O)	CH ₂	-C(O)NHCH ₂ CH ₂ SO ₂ Me
44	CHOH	CH ₂	-C(O)NHCH ₂ CH ₂ SO ₂ Me
45	C(Me)OH	CH ₂	-C(O)NHCH ₂ CH ₂ SO ₂ Me
46	C(O)	CH(Me)	-C(O)NHCH ₂ CH ₂ SO ₂ Me
47	CHOH	CH(Me)	-C(O)NHCH ₂ CH ₂ SO ₂ Me
48	C(Me)OH	CH(Me)	-C(O)NHCH ₂ CH ₂ SO ₂ Me
49	C(O)	CH ₂	-C(O)NHSO ₂ Me
50	CHOH	CH ₂	-C(O)NHSO ₂ Me
51	C(Me)OH	CH ₂	-C(O)NHSO ₂ Me
52	C(O)	CH(Me)	-C(O)NHSO ₂ Me
53	CHOH	CH(Me)	-C(O)NHSO ₂ Me
54	C(Me)OH	CH(Me)	-C(O)NHSO ₂ Me
55	C(O)	CH ₂	-CH ₂ -C(O)NHSO ₂ Et
56	CHOH	CH ₂	-CH ₂ -C(O)NHSO ₂ Et
57	C(Me)OH	CH ₂	-CH ₂ -C(O)NHSO ₂ Et
58	C(O)	CH(Me)	-CH ₂ -C(O)NHSO ₂ Et
59	CHOH	CH(Me)	-CH ₂ -C(O)NHSO ₂ Et
60	C(Me)OH	CH(Me)	-CH ₂ -C(O)NHSO ₂ Et
61	C(O)	CH ₂	-CH ₂ -C(O)NHSO ₂ iPr
62	CHOH	CH ₂	-CH ₂ -C(O)NHSO ₂ iPr
63	C(Me)OH	CH ₂	-CH ₂ -C(O)NHSO ₂ iPr
64	C(O)	CH(Me)	-CH ₂ -C(O)NHSO ₂ iPr
65	CHOH	CH(Me)	-CH ₂ -C(O)NHSO ₂ iPr
66	C(Me)OH	CH(Me)	-CH ₂ -C(O)NHSO ₂ iPr
67	C(O)	CH ₂	-CH ₂ -C(O)NHSO ₂ tBu
68	CHOH	CH ₂	-CH ₂ -C(O)NHSO ₂ tBu

69	C(Me)OH	CH ₂	-CH ₂ -C(O)NHSO ₂ tBu
70	C(O)	CH(Me)	-CH ₂ -C(O)NHSO ₂ tBu
71	CHOH	CH(Me)	-CH ₂ -C(O)NHSO ₂ tBu
72	C(Me)OH	CH(Me)	-CH ₂ -C(O)NHSO ₂ tBu
73	C(O)	CH ₂	-CH ₂ NHSO ₂ Me
74	CHOH	CH ₂	-CH ₂ NHSO ₂ Me
75	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ Me
76	C(O)	CH(Me)	-CH ₂ NHSO ₂ Me
77	CHOH	CH(Me)	-CH ₂ NHSO ₂ Me
78	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ Me
79	C(O)	CH ₂	-CH ₂ NHSO ₂ Et
80	CHOH	CH ₂	-CH ₂ NHSO ₂ Et
81	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ Et
82	C(O)	CH(Me)	-CH ₂ NHSO ₂ Et
83	CHOH	CH(Me)	-CH ₂ NHSO ₂ Et
84	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ Et
85	C(O)	CH ₂	-CH ₂ NHSO ₂ iPr
86	CHOH	CH ₂	-CH ₂ NHSO ₂ iPr
87	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ iPr
88	C(O)	CH(Me)	-CH ₂ NHSO ₂ iPr
89	CHOH	CH(Me)	-CH ₂ NHSO ₂ iPr
90	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ iPr
91	C(O)	CH ₂	-CH ₂ NHSO ₂ tBu
92	CHOH	CH ₂	-CH ₂ NHSO ₂ tBu
93	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ tBu
94	C(O)	CH(Me)	-CH ₂ NHSO ₂ tBu
95	CHOH	CH(Me)	-CH ₂ NHSO ₂ tBu
96	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ tBu
97	C(O)	CH ₂	-CH ₂ -N-pyrrolidin-2-one
98	CHOH	CH ₂	-CH ₂ -N-pyrrolidin-2-one
99	C(Me)OH	CH ₂	-CH ₂ -N-pyrrolidin-2-one

100	C(O)	CH(Me)	-CH ₂ -N-pyrrolidin-2-one
101	CHOH	CH(Me)	-CH ₂ -N-pyrrolidin-2-one
102	C(Me)OH	CH(Me)	-CH ₂ -N-pyrrolidin-2-one
103	C(O)	CH ₂	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
104	CHOH	CH ₂	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
105	C(Me)OH	CH ₂	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
106	C(O)	CH(Me)	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
107	CHOH	CH(Me)	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
108	C(Me)OH	CH(Me)	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
109	C(O)	CH ₂	-CH ₂ CO ₂ Me
110	CHOH	CH ₂	-CH ₂ CO ₂ Me
111	C(Me)OH	CH ₂	-CH ₂ CO ₂ Me
112	C(O)	CH(Me)	-CH ₂ CO ₂ Me
113	CHOH	CH(Me)	-CH ₂ CO ₂ Me
114	C(Me)OH	CH(Me)	-CH ₂ CO ₂ Me
115	C(O)	CH ₂	-CH ₂ CO ₂ H
116	CHOH	CH ₂	-CH ₂ CO ₂ H
117	C(Me)OH	CH ₂	-CH ₂ CO ₂ H
118	C(O)	CH(Me)	-CH ₂ CO ₂ H
119	CHOH	CH(Me)	-CH ₂ CO ₂ H
120	C(Me)OH	CH(Me)	-CH ₂ CO ₂ H
121	C(O)	CH ₂	-CH ₂ C(O)NH ₂
122	CHOH	CH ₂	-CH ₂ C(O)NH ₂
123	C(Me)OH	CH ₂	-CH ₂ C(O)NH ₂
124	C(O)	CH(Me)	-CH ₂ C(O)NH ₂
125	CHOH	CH(Me)	-CH ₂ C(O)NH ₂
126	C(Me)OH	CH(Me)	-CH ₂ C(O)NH ₂
127	C(O)	CH ₂	-CH ₂ C(O)NMe ₂
128	CHOH	CH ₂	-CH ₂ C(O)NMe ₂
129	C(Me)OH	CH ₂	-CH ₂ C(O)NMe ₂
130	C(O)	CH(Me)	-CH ₂ C(O)NMe ₂

131	CHOH	CH(Me)	-CH ₂ C(O)NMe ₂
132	C(Me)OH	CH(Me)	-CH ₂ C(O)NMe ₂
133	C(O)	CH ₂	-CH ₂ C(O)-N-pyrrolidine
134	CHOH	CH ₂	-CH ₂ C(O)-N-pyrrolidine
135	C(Me)OH	CH ₂	-CH ₂ C(O)-N-pyrrolidine
136	C(O)	CH(Me)	-CH ₂ C(O)-N-pyrrolidine
137	CHOH	CH(Me)	-CH ₂ C(O)-N-pyrrolidine
138	C(Me)OH	CH(Me)	-CH ₂ C(O)-N-pyrrolidine
139	C(O)	CH ₂	-CH ₂ -5-tetrazolyl
140	CHOH	CH ₂	-CH ₂ -5-tetrazolyl
141	C(Me)OH	CH ₂	-CH ₂ -5-tetrazolyl
142	C(O)	CH(Me)	-CH ₂ -5-tetrazolyl
143	CHOH	CH(Me)	-CH ₂ -5-tetrazolyl
144	C(Me)OH	CH(Me)	-CH ₂ -5-tetrazolyl
145	C(O)	CH ₂	-C(O)C(O)OH
146	CHOH	CH ₂	-C(O)C(O)OH
147	C(Me)OH	CH ₂	-C(O)C(O)OH
148	C(O)	CH(Me)	-C(O)C(O)OH
149	CHOH	CH(Me)	-C(O)C(O)OH
150	C(Me)OH	CH(Me)	-C(O)C(O)OH
151	C(O)	CH ₂	-CH(OH)C(O)OH
152	CHOH	CH ₂	-CH(OH)C(O)OH
153	C(Me)OH	CH ₂	-CH(OH)C(O)OH
154	C(O)	CH(Me)	-CH(OH)C(O)OH
155	CHOH	CH(Me)	-CH(OH)C(O)OH
156	C(Me)OH	CH(Me)	-CH(OH)C(O)OH
157	C(O)	CH ₂	-C(O)C(O)NH ₂
158	CHOH	CH ₂	-C(O)C(O)NH ₂
159	C(Me)OH	CH ₂	-C(O)C(O)NH ₂
160	C(O)	CH(Me)	-C(O)C(O)NH ₂
161	CHOH	CH(Me)	-C(O)C(O)NH ₂

162	C(Me)OH	CH(Me)	-C(O)C(O)NH ₂
163	C(O)	CH ₂	-CH(OH)C(O)NH ₂
164	CHOH	CH ₂	-CH(OH)C(O)NH ₂
165	C(Me)OH	CH ₂	-CH(OH)C(O)NH ₂
166	C(O)	CH(Me)	-CH(OH)C(O)NH ₂
167	CHOH	CH(Me)	-CH(OH)C(O)NH ₂
168	C(Me)OH	CH(Me)	-CH(OH)C(O)NH ₂
169	C(O)	CH ₂	-C(O)C(O)NMe ₂
170	CHOH	CH ₂	-C(O)C(O)NMe ₂
171	C(Me)OH	CH ₂	-C(O)C(O)NMe ₂
172	C(O)	CH(Me)	-C(O)C(O)NMe ₂
173	CHOH	CH(Me)	-C(O)C(O)NMe ₂
174	C(Me)OH	CH(Me)	-C(O)C(O)NMe ₂
175	C(O)	CH ₂	-CH(OH)C(O)NMe ₂
176	CHOH	CH ₂	-CH(OH)C(O)NMe ₂
177	C(Me)OH	CH ₂	-CH(OH)C(O)NMe ₂
178	C(O)	CH(Me)	-CH(OH)C(O)NMe ₂
179	CHOH	CH(Me)	-CH(OH)C(O)NMe ₂
180	C(Me)OH	CH(Me)	-CH(OH)C(O)NMe ₂
181	C(O)	CH ₂	-CH ₂ CH ₂ CO ₂ H
182	CHOH	CH ₂	-CH ₂ CH ₂ CO ₂ H
183	C(Me)OH	CH ₂	-CH ₂ CH ₂ CO ₂ H
184	C(O)	CH(Me)	-CH ₂ CH ₂ CO ₂ H
185	CHOH	CH(Me)	-CH ₂ CH ₂ CO ₂ H
186	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CO ₂ H
187	C(O)	CH ₂	-CH ₂ CH ₂ C(O)NH ₂
188	CHOH	CH ₂	-CH ₂ CH ₂ C(O)NH ₂
189	C(Me)OH	CH ₂	-CH ₂ CH ₂ C(O)NH ₂
190	C(O)	CH(Me)	-CH ₂ CH ₂ C(O)NH ₂
191	CHOH	CH(Me)	-CH ₂ CH ₂ C(O)NH ₂
192	C(Me)OH	CH(Me)	-CH ₂ CH ₂ C(O)NH ₂

193	C(O)	CH ₂	-CH ₂ CH ₂ C(O)NMe ₂
194	CHOH	CH ₂	-CH ₂ CH ₂ C(O)NMe ₂
195	C(Me)OH	CH ₂	-CH ₂ CH ₂ C(O)NMe ₂
196	C(O)	CH(Me)	-CH ₂ CH ₂ C(O)NMe ₂
197	CHOH	CH(Me)	-CH ₂ CH ₂ C(O)NMe ₂
198	C(Me)OH	CH(Me)	-CH ₂ CH ₂ C(O)NMe ₂
199	C(O)	CH ₂	-CH ₂ CH ₂ -5-tetrazolyl
200	CHOH	CH ₂	-CH ₂ CH ₂ -5-tetrazolyl
201	C(Me)OH	CH ₂	-CH ₂ CH ₂ -5-tetrazolyl
202	C(O)	CH(Me)	-CH ₂ CH ₂ -5-tetrazolyl
203	CHOH	CH(Me)	-CH ₂ CH ₂ -5-tetrazolyl
204	C(Me)OH	CH(Me)	-CH ₂ CH ₂ -5-tetrazolyl
205	C(O)	CH ₂	-CH ₂ S(O) ₂ Me
206	CHOH	CH ₂	-CH ₂ S(O) ₂ Me
207	C(Me)OH	CH ₂	-CH ₂ S(O) ₂ Me
208	C(O)	CH(Me)	-CH ₂ S(O) ₂ Me
209	CHOH	CH(Me)	-CH ₂ S(O) ₂ Me
210	C(Me)OH	CH(Me)	-CH ₂ S(O) ₂ Me
211	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ Me
212	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Me
213	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Me
214	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Me
215	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Me
216	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Me
217	C(O)	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
218	CHOH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
219	C(Me)OH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
220	C(O)	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
221	CHOH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
222	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
223	C(O)	CH ₂	-CH ₂ S(O) ₂ Et

224	CHOH	CH ₂	-CH ₂ S(O) ₂ Et
225	C(Me)OH	CH ₂	-CH ₂ S(O) ₂ Et
226	C(O)	CH(Me)	-CH ₂ S(O) ₂ Et
227	CHOH	CH(Me)	-CH ₂ S(O) ₂ Et
228	C(Me)OH	CH(Me)	-CH ₂ S(O) ₂ Et
229	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ Et
230	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Et
231	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Et
232	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Et
233	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Et
234	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Et
235	C(O)	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
236	CHOH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
237	C(Me)OH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
238	C(O)	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
239	CHOH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
240	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
241	C(O)	CH ₂	-CH ₂ S(O) ₂ iPr
242	CHOH	CH ₂	-CH ₂ S(O) ₂ iPr
243	C(Me)OH	CH ₂	-CH ₂ S(O) ₂ iPr
244	C(O)	CH(Me)	-CH ₂ S(O) ₂ iPr
245	CHOH	CH(Me)	-CH ₂ S(O) ₂ iPr
246	C(Me)OH	CH(Me)	-CH ₂ S(O) ₂ iPr
247	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ iPr
248	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ iPr
249	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ iPr
250	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ iPr
251	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ iPr
252	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ iPr
253	C(O)	CH ₂	-CH ₂ S(O) ₂ tBu
254	CHOH	CH ₂	-CH ₂ S(O) ₂ tBu

255	C(Me)OH	CH ₂	-CH ₂ S(O) ₂ tBu
256	C(O)	CH(Me)	-CH ₂ S(O) ₂ tBu
257	CHOH	CH(Me)	-CH ₂ S(O) ₂ tBu
258	C(Me)OH	CH(Me)	-CH ₂ S(O) ₂ tBu
259	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ tBu
260	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ tBu
261	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ tBu
262	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ tBu
263	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ tBu
264	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ tBu
265	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ NH ₂
266	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NH ₂
267	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NH ₂
268	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NH ₂
269	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NH ₂
270	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NH ₂
271	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ NMe ₂
272	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NMe ₂
273	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NMe ₂
274	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NMe ₂
275	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NMe ₂
276	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NMe ₂
277	C(O)	CH ₂	-C(O)CH ₂ S(O) ₂ Me
278	CHOH	CH ₂	-C(O)CH ₂ S(O) ₂ Me
279	C(Me)OH	CH ₂	-C(O)CH ₂ S(O) ₂ Me
280	C(O)	CH(Me)	-C(O)CH ₂ S(O) ₂ Me
281	CHOH	CH(Me)	-C(O)CH ₂ S(O) ₂ Me
282	C(Me)OH	CH(Me)	-C(O)CH ₂ S(O) ₂ Me
283	C(O)	CH ₂	-C(O)CH ₂ CH ₂ S(O) ₂ Me
284	CHOH	CH ₂	-C(O)CH ₂ CH ₂ S(O) ₂ Me
285	C(Me)OH	CH ₂	-C(O)CH ₂ CH ₂ S(O) ₂ Me

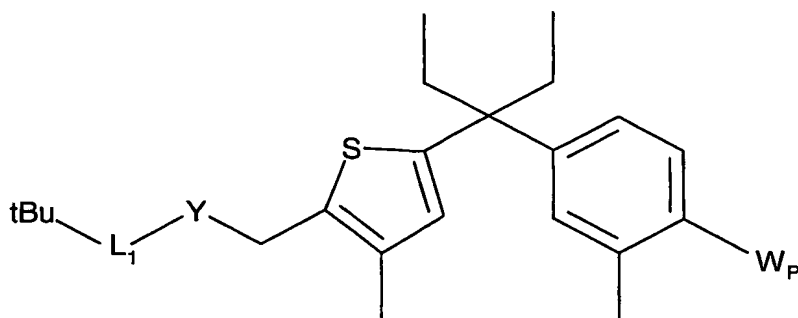
286	C(O)	CH(Me)	-C(O)CH ₂ CH ₂ S(O) ₂ Me
287	CHOH	CH(Me)	-C(O)CH ₂ CH ₂ S(O) ₂ Me
288	C(Me)OH	CH(Me)	-C(O)CH ₂ CH ₂ S(O) ₂ Me
289	C(O)	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
290	CHOH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
291	C(Me)OH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
292	C(O)	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
293	CHOH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
294	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
295	C(O)	CH ₂	-S(O) ₂ Me
296	CHOH	CH ₂	-S(O) ₂ Me
297	C(Me)OH	CH ₂	-S(O) ₂ Me
298	C(O)	CH(Me)	-S(O) ₂ Me
299	CHOH	CH(Me)	-S(O) ₂ Me
300	C(Me)OH	CH(Me)	-S(O) ₂ Me
301	C(O)	CH ₂	-S(O) ₂ Et
302	CHOH	CH ₂	-S(O) ₂ Et
303	C(Me)OH	CH ₂	-S(O) ₂ Et
304	C(O)	CH(Me)	-S(O) ₂ Et
305	CHOH	CH(Me)	-S(O) ₂ Et
306	C(Me)OH	CH(Me)	-S(O) ₂ Et
307	C(O)	CH ₂	-S(O) ₂ iPr
308	CHOH	CH ₂	-S(O) ₂ iPr
309	C(Me)OH	CH ₂	-S(O) ₂ iPr
310	C(O)	CH(Me)	-S(O) ₂ iPr
311	CHOH	CH(Me)	-S(O) ₂ iPr
312	C(Me)OH	CH(Me)	-S(O) ₂ iPr
313	C(O)	CH ₂	-S(O) ₂ tBu
314	CHOH	CH ₂	-S(O) ₂ tBu
315	C(Me)OH	CH ₂	-S(O) ₂ tBu
316	C(O)	CH(Me)	-S(O) ₂ tBu

317	CHOH	CH(Me)	-S(O) ₂ tBu
318	C(Me)OH	CH(Me)	-S(O) ₂ tBu
319	C(O)	CH ₂	-S(O) ₂ NH ₂
320	CHOH	CH ₂	-S(O) ₂ NH ₂
321	C(Me)OH	CH ₂	-S(O) ₂ NH ₂
322	C(O)	CH(Me)	-S(O) ₂ NH ₂
323	CHOH	CH(Me)	-S(O) ₂ NH ₂
324	C(Me)OH	CH(Me)	-S(O) ₂ NH ₂
325	C(O)	CH ₂	-S(O) ₂ NMe ₂
326	CHOH	CH ₂	-S(O) ₂ NMe ₂
327	C(Me)OH	CH ₂	-S(O) ₂ NMe ₂
328	C(O)	CH(Me)	-S(O) ₂ NMe ₂
329	CHOH	CH(Me)	-S(O) ₂ NMe ₂
330	C(Me)OH	CH(Me)	-S(O) ₂ NMe ₂
331	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Me
332	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Me
333	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Me
334	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Me
335	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Me
336	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Me
337	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Et
338	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Et
339	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Et
340	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Et
341	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Et
342	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Et
343	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ iPr
344	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ iPr
345	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ iPr
346	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ iPr
347	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ iPr

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348	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ iPr
349	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ tBu
350	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ tBu
351	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ tBu
352	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ tBu
353	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ tBu
354	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ tBu
355	C(O)	CH ₂	-C(O)NHCH ₂ CO ₂ H
356	CHOH	CH ₂	-C(O)NHCH ₂ CO ₂ H
357	C(Me)OH	CH ₂	-C(O)NHCH ₂ CO ₂ H
358	C(O)	CH(Me)	-C(O)NHCH ₂ CO ₂ H
359	CHOH	CH(Me)	-C(O)NHCH ₂ CO ₂ H
360	C(Me)OH	CH(Me)	-C(O)NHCH ₂ CO ₂ H
361	C(O)	CH ₂	-SO ₂ NHCH ₂ CO ₂ H
362	CHOH	CH ₂	-SO ₂ NHCH ₂ CO ₂ H
363	C(Me)OH	CH ₂	-SO ₂ NHCH ₂ CO ₂ H
364	C(O)	CH(Me)	-SO ₂ NHCH ₂ CO ₂ H
365	CHOH	CH(Me)	-SO ₂ NHCH ₂ CO ₂ H
366	C(Me)OH	CH(Me)	-SO ₂ NHCH ₂ CO ₂ H
367	C(O)	CH ₂	-CH ₂ -S-Me
368	CHOH	CH ₂	-CH ₂ -S-Me
369	C(Me)OH	CH ₂	-CH ₂ -S-Me
370	C(O)	CH(Me)	-CH ₂ -S-Me
371	CHOH	CH(Me)	-CH ₂ -S-Me
372	C(Me)OH	CH(Me)	-CH ₂ -S-Me

Table 2



Code	L_1	Y	W_P
1A	C(O)	CH ₂	-CO ₂ Me
2A	CHOH	CH ₂	-CO ₂ Me
3A	C(Me)OH	CH ₂	-CO ₂ Me
4A	C(O)	CH(Me)	-CO ₂ Me
5A	CHOH	CH(Me)	-CO ₂ Me
6A	C(Me)OH	CH(Me)	-CO ₂ Me
7A	C(O)	CH ₂	-CO ₂ H
8A	CHOH	CH ₂	-CO ₂ H
9A	C(Me)OH	CH ₂	-CO ₂ H
10A	C(O)	CH(Me)	-CO ₂ H
11A	CHOH	CH(Me)	-CO ₂ H
12A	C(Me)OH	CH(Me)	-CO ₂ H
13A	C(O)	CH ₂	-C(O)NH ₂
14A	CHOH	CH ₂	-C(O)NH ₂
15A	C(Me)OH	CH ₂	-C(O)NH ₂
16A	C(O)	CH(Me)	-C(O)NH ₂
17A	CHOH	CH(Me)	-C(O)NH ₂
18A	C(Me)OH	CH(Me)	-C(O)NH ₂
19A	C(O)	CH ₂	-C(O)NMe ₂
20A	CHOH	CH ₂	-C(O)NMe ₂

21A	C(Me)OH	CH ₂	-C(O)NMe ₂
22A	C(O)	CH(Me)	-C(O)NMe ₂
23A	CHOH	CH(Me)	-C(O)NMe ₂
24A	C(Me)OH	CH(Me)	-C(O)NMe ₂
25A	C(O)	CH ₂	5-tetrazolyl
26A	CHOH	CH ₂	5-tetrazolyl
27A	C(Me)OH	CH ₂	5-tetrazolyl
28A	C(O)	CH(Me)	5-tetrazolyl
29A	CHOH	CH(Me)	5-tetrazolyl
30A	C(Me)OH	CH(Me)	5-tetrazolyl
31A	C(O)	CH ₂	-C(O)-NH-5-tetrazolyl
32A	CHOH	CH ₂	-C(O)-NH-5-tetrazolyl
33A	C(Me)OH	CH ₂	-C(O)-NH-5-tetrazolyl
34A	C(O)	CH(Me)	-C(O)-NH-5-tetrazolyl
35A	CHOH	CH(Me)	-C(O)-NH-5-tetrazolyl
36A	C(Me)OH	CH(Me)	-C(O)-NH-5-tetrazolyl
37A	C(O)	CH ₂	-C(O)NHCH ₂ SO ₂ Me
38A	CHOH	CH ₂	-C(O)NHCH ₂ SO ₂ Me
39A	C(Me)OH	CH ₂	-C(O)NHCH ₂ SO ₂ Me
40A	C(O)	CH(Me)	-C(O)NHCH ₂ SO ₂ Me
41A	CHOH	CH(Me)	-C(O)NHCH ₂ SO ₂ Me
42A	C(Me)OH	CH(Me)	-C(O)NHCH ₂ SO ₂ Me
43A	C(O)	CH ₂	-C(O)NHCH ₂ CH ₂ SO ₂ Me
44A	CHOH	CH ₂	-C(O)NHCH ₂ CH ₂ SO ₂ Me
45A	C(Me)OH	CH ₂	-C(O)NHCH ₂ CH ₂ SO ₂ Me
46A	C(O)	CH(Me)	-C(O)NHCH ₂ CH ₂ SO ₂ Me
47A	CHOH	CH(Me)	-C(O)NHCH ₂ CH ₂ SO ₂ Me
48A	C(Me)OH	CH(Me)	-C(O)NHCH ₂ CH ₂ SO ₂ Me
49A	C(O)	CH ₂	-C(O)NHSO ₂ Me
50A	CHOH	CH ₂	-C(O)NHSO ₂ Me
51A	C(Me)OH	CH ₂	-C(O)NHSO ₂ Me

52A	C(O)	CH(Me)	-C(O)NHSO ₂ Me
53A	CHOH	CH(Me)	-C(O)NHSO ₂ Me
54A	C(Me)OH	CH(Me)	-C(O)NHSO ₂ Me
55A	C(O)	CH ₂	-CH ₂ -C(O)NHSO ₂ Et
56A	CHOH	CH ₂	-CH ₂ -C(O)NHSO ₂ Et
57A	C(Me)OH	CH ₂	-CH ₂ -C(O)NHSO ₂ Et
58A	C(O)	CH(Me)	-CH ₂ -C(O)NHSO ₂ Et
59A	CHOH	CH(Me)	-CH ₂ -C(O)NHSO ₂ Et
60A	C(Me)OH	CH(Me)	-CH ₂ -C(O)NHSO ₂ Et
61A	C(O)	CH ₂	-CH ₂ -C(O)NHSO ₂ iPr
62A	CHOH	CH ₂	-CH ₂ -C(O)NHSO ₂ iPr
63A	C(Me)OH	CH ₂	-CH ₂ -C(O)NHSO ₂ iPr
64A	C(O)	CH(Me)	-CH ₂ -C(O)NHSO ₂ iPr
65A	CHOH	CH(Me)	-CH ₂ -C(O)NHSO ₂ iPr
66A	C(Me)OH	CH(Me)	-CH ₂ -C(O)NHSO ₂ iPr
67A	C(O)	CH ₂	-CH ₂ -C(O)NHSO ₂ tBu
68A	CHOH	CH ₂	-CH ₂ -C(O)NHSO ₂ tBu
69A	C(Me)OH	CH ₂	-CH ₂ -C(O)NHSO ₂ tBu
70A	C(O)	CH(Me)	-CH ₂ -C(O)NHSO ₂ tBu
71A	CHOH	CH(Me)	-CH ₂ -C(O)NHSO ₂ tBu
72A	C(Me)OH	CH(Me)	-CH ₂ -C(O)NHSO ₂ tBu
73A	C(O)	CH ₂	-CH ₂ NHSO ₂ Me
74A	CHOH	CH ₂	-CH ₂ NHSO ₂ Me
75A	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ Me
76A	C(O)	CH(Me)	-CH ₂ NHSO ₂ Me
77A	CHOH	CH(Me)	-CH ₂ NHSO ₂ Me
78A	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ Me
79A	C(O)	CH ₂	-CH ₂ NHSO ₂ Et
80A	CHOH	CH ₂	-CH ₂ NHSO ₂ Et
81A	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ Et
82A	C(O)	CH(Me)	-CH ₂ NHSO ₂ Et

-100-

83A	CHOH	CH(Me)	-CH ₂ NHSO ₂ Et
84A	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ Et
85A	C(O)	CH ₂	-CH ₂ NHSO ₂ iPr
86A	CHOH	CH ₂	-CH ₂ NHSO ₂ iPr
87A	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ iPr
88A	C(O)	CH(Me)	-CH ₂ NHSO ₂ iPr
89A	CHOH	CH(Me)	-CH ₂ NHSO ₂ iPr
90A	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ iPr
91A	C(O)	CH ₂	-CH ₂ NHSO ₂ tBu
92A	CHOH	CH ₂	-CH ₂ NHSO ₂ tBu
93A	C(Me)OH	CH ₂	-CH ₂ NHSO ₂ tBu
94A	C(O)	CH(Me)	-CH ₂ NHSO ₂ tBu
95A	CHOH	CH(Me)	-CH ₂ NHSO ₂ tBu
96A	C(Me)OH	CH(Me)	-CH ₂ NHSO ₂ tBu
97A	C(O)	CH ₂	-CH ₂ -N-pyrrolidin-2-one
98A	CHOH	CH ₂	-CH ₂ -N-pyrrolidin-2-one
99A	C(Me)OH	CH ₂	-CH ₂ -N-pyrrolidin-2-one
100A	C(O)	CH(Me)	-CH ₂ -N-pyrrolidin-2-one
101A	CHOH	CH(Me)	-CH ₂ -N-pyrrolidin-2-one
102A	C(Me)OH	CH(Me)	-CH ₂ -N-pyrrolidin-2-one
103A	C(O)	CH ₂	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
104A	CHOH	CH ₂	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
105A	C(Me)OH	CH ₂	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
106A	C(O)	CH(Me)	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
107A	CHOH	CH(Me)	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
108A	C(Me)OH	CH(Me)	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
109A	C(O)	CH ₂	-CH ₂ CO ₂ Me
110A	CHOH	CH ₂	-CH ₂ CO ₂ Me
111A	C(Me)OH	CH ₂	-CH ₂ CO ₂ Me
112A	C(O)	CH(Me)	-CH ₂ CO ₂ Me
113A	CHOH	CH(Me)	-CH ₂ CO ₂ Me

114A	C(Me)OH	CH(Me)	-CH ₂ CO ₂ Me
115A	C(O)	CH ₂	-CH ₂ CO ₂ H
116A	CHOH	CH ₂	-CH ₂ CO ₂ H
117A	C(Me)OH	CH ₂	-CH ₂ CO ₂ H
118A	C(O)	CH(Me)	-CH ₂ CO ₂ H
119A	CHOH	CH(Me)	-CH ₂ CO ₂ H
120A	C(Me)OH	CH(Me)	-CH ₂ CO ₂ H
121A	C(O)	CH ₂	-CH ₂ C(O)NH ₂
122A	CHOH	CH ₂	-CH ₂ C(O)NH ₂
123A	C(Me)OH	CH ₂	-CH ₂ C(O)NH ₂
124A	C(O)	CH(Me)	-CH ₂ C(O)NH ₂
125A	CHOH	CH(Me)	-CH ₂ C(O)NH ₂
126A	C(Me)OH	CH(Me)	-CH ₂ C(O)NH ₂
127A	C(O)	CH ₂	-CH ₂ C(O)NMe ₂
128A	CHOH	CH ₂	-CH ₂ C(O)NMe ₂
129A	C(Me)OH	CH ₂	-CH ₂ C(O)NMe ₂
130A	C(O)	CH(Me)	-CH ₂ C(O)NMe ₂
131A	CHOH	CH(Me)	-CH ₂ C(O)NMe ₂
132A	C(Me)OH	CH(Me)	-CH ₂ C(O)NMe ₂
133A	C(O)	CH ₂	-CH ₂ C(O)-N-pyrrolidine
134A	CHOH	CH ₂	-CH ₂ C(O)-N-pyrrolidine
135A	C(Me)OH	CH ₂	-CH ₂ C(O)-N-pyrrolidine
136A	C(O)	CH(Me)	-CH ₂ C(O)-N-pyrrolidine
137A	CHOH	CH(Me)	-CH ₂ C(O)-N-pyrrolidine
138A	C(Me)OH	CH(Me)	-CH ₂ C(O)-N-pyrrolidine
139A	C(O)	CH ₂	-CH ₂ -5-tetrazolyl
140A	CHOH	CH ₂	-CH ₂ -5-tetrazolyl
141A	C(Me)OH	CH ₂	-CH ₂ -5-tetrazolyl
142A	C(O)	CH(Me)	-CH ₂ -5-tetrazolyl
143A	CHOH	CH(Me)	-CH ₂ -5-tetrazolyl
144A	C(Me)OH	CH(Me)	-CH ₂ -5-tetrazolyl

145A	C(O)	CH ₂	-C(O)C(O)OH
146A	CHOH	CH ₂	-C(O)C(O)OH
147A	C(Me)OH	CH ₂	-C(O)C(O)OH
148A	C(O)	CH(Me)	-C(O)C(O)OH
149A	CHOH	CH(Me)	-C(O)C(O)OH
150A	C(Me)OH	CH(Me)	-C(O)C(O)OH
151A	C(O)	CH ₂	-CH(OH)C(O)OH
152A	CHOH	CH ₂	-CH(OH)C(O)OH
153A	C(Me)OH	CH ₂	-CH(OH)C(O)OH
154A	C(O)	CH(Me)	-CH(OH)C(O)OH
155A	CHOH	CH(Me)	-CH(OH)C(O)OH
156A	C(Me)OH	CH(Me)	-CH(OH)C(O)OH
157A	C(O)	CH ₂	-C(O)C(O)NH ₂
158A	CHOH	CH ₂	-C(O)C(O)NH ₂
159A	C(Me)OH	CH ₂	-C(O)C(O)NH ₂
160A	C(O)	CH(Me)	-C(O)C(O)NH ₂
161A	CHOH	CH(Me)	-C(O)C(O)NH ₂
162A	C(Me)OH	CH(Me)	-C(O)C(O)NH ₂
163A	C(O)	CH ₂	-CH(OH)C(O)NH ₂
164A	CHOH	CH ₂	-CH(OH)C(O)NH ₂
165A	C(Me)OH	CH ₂	-CH(OH)C(O)NH ₂
166A	C(O)	CH(Me)	-CH(OH)C(O)NH ₂
167A	CHOH	CH(Me)	-CH(OH)C(O)NH ₂
168A	C(Me)OH	CH(Me)	-CH(OH)C(O)NH ₂
169A	C(O)	CH ₂	-C(O)C(O)NMe ₂
170A	CHOH	CH ₂	-C(O)C(O)NMe ₂
171A	C(Me)OH	CH ₂	-C(O)C(O)NMe ₂
172A	C(O)	CH(Me)	-C(O)C(O)NMe ₂
173A	CHOH	CH(Me)	-C(O)C(O)NMe ₂
174A	C(Me)OH	CH(Me)	-C(O)C(O)NMe ₂
175A	C(O)	CH ₂	-CH(OH)C(O)NMe ₂

176A	CHOH	CH ₂	-CH(OH)C(O)NMe ₂
177A	C(Me)OH	CH ₂	-CH(OH)C(O)NMe ₂
178A	C(O)	CH(Me)	-CH(OH)C(O)NMe ₂
179A	CHOH	CH(Me)	-CH(OH)C(O)NMe ₂
180A	C(Me)OH	CH(Me)	-CH(OH)C(O)NMe ₂
181A	C(O)	CH ₂	-CH ₂ CH ₂ CO ₂ H
182A	CHOH	CH ₂	-CH ₂ CH ₂ CO ₂ H
183A	C(Me)OH	CH ₂	-CH ₂ CH ₂ CO ₂ H
184A	C(O)	CH(Me)	-CH ₂ CH ₂ CO ₂ H
185A	CHOH	CH(Me)	-CH ₂ CH ₂ CO ₂ H
186A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CO ₂ H
187A	C(O)	CH ₂	-CH ₂ CH ₂ C(O)NH ₂
188A	CHOH	CH ₂	-CH ₂ CH ₂ C(O)NH ₂
189A	C(Me)OH	CH ₂	-CH ₂ CH ₂ C(O)NH ₂
190A	C(O)	CH(Me)	-CH ₂ CH ₂ C(O)NH ₂
191A	CHOH	CH(Me)	-CH ₂ CH ₂ C(O)NH ₂
192A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ C(O)NH ₂
193A	C(O)	CH ₂	-CH ₂ CH ₂ C(O)NMe ₂
194A	CHOH	CH ₂	-CH ₂ CH ₂ C(O)NMe ₂
195A	C(Me)OH	CH ₂	-CH ₂ CH ₂ C(O)NMe ₂
196A	C(O)	CH(Me)	-CH ₂ CH ₂ C(O)NMe ₂
197A	CHOH	CH(Me)	-CH ₂ CH ₂ C(O)NMe ₂
198A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ C(O)NMe ₂
199A	C(O)	CH ₂	-CH ₂ CH ₂ -5-tetrazolyl
200A	CHOH	CH ₂	-CH ₂ CH ₂ -5-tetrazolyl
201A	C(Me)OH	CH ₂	-CH ₂ CH ₂ -5-tetrazolyl
202A	C(O)	CH(Me)	-CH ₂ CH ₂ -5-tetrazolyl
203A	CHOH	CH(Me)	-CH ₂ CH ₂ -5-tetrazolyl
204A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ -5-tetrazolyl
205A	C(O)	CH ₂	-OCH ₂ S(O) ₂ Me
206A	CHOH	CH ₂	-OCH ₂ S(O) ₂ Me

207A	C(Me)OH	CH ₂	-OCH ₂ S(O) ₂ Me
208A	C(O)	CH(Me)	-OCH ₂ S(O) ₂ Me
209A	CHOH	CH(Me)	-OCH ₂ S(O) ₂ Me
210A	C(Me)OH	CH(Me)	-OCH ₂ S(O) ₂ Me
211A	C(O)	CH ₂	-OCH ₂ CH ₂ S(O) ₂ Me
212A	CHOH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ Me
213A	C(Me)OH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ Me
214A	C(O)	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ Me
215A	CHOH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ Me
216A	C(Me)OH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ Me
217A	C(O)	CH ₂	-CH ₂ S(O) ₂ Me
218A	CHOH	CH ₂	-CH ₂ S(O) ₂ Me
219A	C(Me)OH	CH ₂	-CH ₂ S(O) ₂ Me
220A	C(O)	CH(Me)	-CH ₂ S(O) ₂ Me
221A	CHOH	CH(Me)	-CH ₂ S(O) ₂ Me
222A	C(Me)OH	CH(Me)	-CH ₂ S(O) ₂ Me
223A	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ Me
224A	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Me
225A	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Me
226A	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Me
227A	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Me
228A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Me
229A	C(O)	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
230A	CHOH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
231A	C(Me)OH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
232A	C(O)	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
233A	CHOH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
234A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
235A	C(O)	CH ₂	-OCH ₂ S(O) ₂ Et
236A	CHOH	CH ₂	-OCH ₂ S(O) ₂ Et
237A	C(Me)OH	CH ₂	-OCH ₂ S(O) ₂ Et

238A	C(O)	CH(Me)	-OCH ₂ S(O) ₂ Et
239A	CHOH	CH(Me)	-OCH ₂ S(O) ₂ Et
240A	C(Me)OH	CH(Me)	-OCH ₂ S(O) ₂ Et
241A	C(O)	CH ₂	-OCH ₂ CH ₂ S(O) ₂ Et
242A	CHOH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ Et
243A	C(Me)OH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ Et
244A	C(O)	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ Et
245A	CHOH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ Et
246A	C(Me)OH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ Et
247A	C(O)	CH ₂	-CH ₂ S(O) ₂ Et
248A	CHOH	CH ₂	-CH ₂ S(O) ₂ Et
249A	C(Me)OH	CH ₂	-CH ₂ S(O) ₂ Et
250A	C(O)	CH(Me)	-CH ₂ S(O) ₂ Et
251A	CHOH	CH(Me)	-CH ₂ S(O) ₂ Et
252A	C(Me)OH	CH(Me)	-CH ₂ S(O) ₂ Et
253A	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ Et
254A	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Et
255A	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ Et
256A	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Et
257A	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Et
258A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ Et
259A	C(O)	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
260A	CHOH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
261A	C(Me)OH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
262A	C(O)	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
263A	CHOH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
264A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
265A	C(O)	CH ₂	-OCH ₂ S(O) ₂ iPr
266A	CHOH	CH ₂	-OCH ₂ S(O) ₂ iPr
267A	C(Me)OH	CH ₂	-OCH ₂ S(O) ₂ iPr
268A	C(O)	CH(Me)	-OCH ₂ S(O) ₂ iPr

269A	CHOH	CH(Me)	-OCH ₂ S(O)2iPr
270A	C(Me)OH	CH(Me)	-OCH ₂ S(O)2iPr
271A	C(O)	CH ₂	-CH ₂ S(O)2iPr
272A	CHOH	CH ₂	-CH ₂ S(O)2iPr
273A	C(Me)OH	CH ₂	-CH ₂ S(O)2iPr
274A	C(O)	CH(Me)	-CH ₂ S(O)2iPr
275A	CHOH	CH(Me)	-CH ₂ S(O)2iPr
276A	C(Me)OH	CH(Me)	-CH ₂ S(O)2iPr
277A	C(O)	CH ₂	-CH ₂ CH ₂ S(O)2iPr
278A	CHOH	CH ₂	-CH ₂ CH ₂ S(O)2iPr
279A	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O)2iPr
280A	C(O)	CH(Me)	-CH ₂ CH ₂ S(O)2iPr
281A	CHOH	CH(Me)	-CH ₂ CH ₂ S(O)2iPr
282A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O)2iPr
283A	C(O)	CH ₂	-OCH ₂ S(O)2tBu
284A	CHOH	CH ₂	-OCH ₂ S(O)2tBu
285A	C(Me)OH	CH ₂	-OCH ₂ S(O)2tBu
286A	C(O)	CH(Me)	-OCH ₂ S(O)2tBu
287A	CHOH	CH(Me)	-OCH ₂ S(O)2tBu
288A	C(Me)OH	CH(Me)	-OCH ₂ S(O)2tBu
289A	C(O)	CH ₂	-CH ₂ S(O)2tBu
290A	CHOH	CH ₂	-CH ₂ S(O)2tBu
291A	C(Me)OH	CH ₂	-CH ₂ S(O)2tBu
292A	C(O)	CH(Me)	-CH ₂ S(O)2tBu
293A	CHOH	CH(Me)	-CH ₂ S(O)2tBu
294A	C(Me)OH	CH(Me)	-CH ₂ S(O)2tBu
295A	C(O)	CH ₂	-CH ₂ CH ₂ S(O)2tBu
296A	CHOH	CH ₂	-CH ₂ CH ₂ S(O)2tBu
297A	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O)2tBu
298A	C(O)	CH(Me)	-CH ₂ CH ₂ S(O)2tBu
299A	CHOH	CH(Me)	-CH ₂ CH ₂ S(O)2tBu

300A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ tBu
301A	C(O)	CH ₂	-OCH ₂ S(O) ₂ NH ₂
302A	CHOH	CH ₂	-OCH ₂ S(O) ₂ NH ₂
303A	C(Me)OH	CH ₂	-OCH ₂ S(O) ₂ NH ₂
304A	C(O)	CH(Me)	-OCH ₂ S(O) ₂ NH ₂
305A	CHOH	CH(Me)	-OCH ₂ S(O) ₂ NH ₂
306A	C(Me)OH	CH(Me)	-OCH ₂ S(O) ₂ NH ₂
307A	C(O)	CH ₂	-OCH ₂ S(O) ₂ NMe ₂
308A	CHOH	CH ₂	-OCH ₂ S(O) ₂ NMe ₂
309A	C(Me)OH	CH ₂	-OCH ₂ S(O) ₂ NMe ₂
310A	C(O)	CH(Me)	-OCH ₂ S(O) ₂ NMe ₂
311A	CHOH	CH(Me)	-OCH ₂ S(O) ₂ NMe ₂
312A	C(Me)OH	CH(Me)	-OCH ₂ S(O) ₂ NMe ₂
313A	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ NH ₂
314A	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NH ₂
315A	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NH ₂
316A	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NH ₂
317A	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NH ₂
318A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NH ₂
319A	C(O)	CH ₂	-CH ₂ CH ₂ S(O) ₂ NMe ₂
320A	CHOH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NMe ₂
321A	C(Me)OH	CH ₂	-CH ₂ CH ₂ S(O) ₂ NMe ₂
322A	C(O)	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NMe ₂
323A	CHOH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NMe ₂
324A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ S(O) ₂ NMe ₂
325A	C(O)	CH ₂	-C(O)CH ₂ S(O) ₂ Me
326A	CHOH	CH ₂	-C(O)CH ₂ S(O) ₂ Me
327A	C(Me)OH	CH ₂	-C(O)CH ₂ S(O) ₂ Me
328A	C(O)	CH(Me)	-C(O)CH ₂ S(O) ₂ Me
329A	CHOH	CH(Me)	-C(O)CH ₂ S(O) ₂ Me
330A	C(Me)OH	CH(Me)	-C(O)CH ₂ S(O) ₂ Me

331A	C(O)	CH ₂	-C(O)CH ₂ CH ₂ S(O) ₂ Me
332A	CHOH	CH ₂	-C(O)CH ₂ CH ₂ S(O) ₂ Me
333A	C(Me)OH	CH ₂	-C(O)CH ₂ CH ₂ S(O) ₂ Me
334A	C(O)	CH(Me)	-C(O)CH ₂ CH ₂ S(O) ₂ Me
335A	CHOH	CH(Me)	-C(O)CH ₂ CH ₂ S(O) ₂ Me
336A	C(Me)OH	CH(Me)	-C(O)CH ₂ CH ₂ S(O) ₂ Me
337A	C(O)	CH ₂	-OCH ₂ CH ₂ S(O) ₂ NH ₂
338A	CHOH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ NH ₂
339A	C(Me)OH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ NH ₂
340A	C(O)	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ NH ₂
341A	CHOH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ NH ₂
342A	C(Me)OH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ NH ₂
343A	C(O)	CH ₂	-OCH ₂ CH ₂ S(O) ₂ NMe ₂
344A	CHOH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ NMe ₂
345A	C(Me)OH	CH ₂	-OCH ₂ CH ₂ S(O) ₂ NMe ₂
346A	C(O)	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ NMe ₂
347A	CHOH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ NMe ₂
348A	C(Me)OH	CH(Me)	-OCH ₂ CH ₂ S(O) ₂ NMe ₂
349A	C(O)	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
350A	CHOH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
351A	C(Me)OH	CH ₂	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
352A	C(O)	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
353A	CHOH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
354A	C(Me)OH	CH(Me)	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
355A	C(O)	CH ₂	-S(O) ₂ Me
356A	CHOH	CH ₂	-S(O) ₂ Me
357A	C(Me)OH	CH ₂	-S(O) ₂ Me
358A	C(O)	CH(Me)	-S(O) ₂ Me
359A	CHOH	CH(Me)	-S(O) ₂ Me
360A	C(Me)OH	CH(Me)	-S(O) ₂ Me
361A	C(O)	CH ₂	-S(O) ₂ Et

362A	CHOH	CH ₂	-S(O) ₂ Et
363A	C(Me)OH	CH ₂	-S(O) ₂ Et
364A	C(O)	CH(Me)	-S(O) ₂ Et
365A	CHOH	CH(Me)	-S(O) ₂ Et
366A	C(Me)OH	CH(Me)	-S(O) ₂ Et
367A	C(O)	CH ₂	-S(O) ₂ iPr
368A	CHOH	CH ₂	-S(O) ₂ iPr
369A	C(Me)OH	CH ₂	-S(O) ₂ iPr
370A	C(O)	CH(Me)	-S(O) ₂ iPr
371A	CHOH	CH(Me)	-S(O) ₂ iPr
372A	C(Me)OH	CH(Me)	-S(O) ₂ iPr
373A	C(O)	CH ₂	-S(O) ₂ tBu
374A	CHOH	CH ₂	-S(O) ₂ tBu
375A	C(Me)OH	CH ₂	-S(O) ₂ tBu
376A	C(O)	CH(Me)	-S(O) ₂ tBu
377A	CHOH	CH(Me)	-S(O) ₂ tBu
378A	C(Me)OH	CH(Me)	-S(O) ₂ tBu
379A	C(O)	CH ₂	-OCH ₂ CO ₂ H
380A	CHOH	CH ₂	-OCH ₂ CO ₂ H
381A	C(Me)OH	CH ₂	-OCH ₂ CO ₂ H
382A	C(O)	CH(Me)	-OCH ₂ CO ₂ H
383A	CHOH	CH(Me)	-OCH ₂ CO ₂ H
384A	C(Me)OH	CH(Me)	-OCH ₂ CO ₂ H
385A	C(O)	CH ₂	-OCH ₂ -5-tetrazolyl
386A	CHOH	CH ₂	-OCH ₂ -5-tetrazolyl
387A	C(Me)OH	CH ₂	-OCH ₂ -5-tetrazolyl
388A	C(O)	CH(Me)	-OCH ₂ -5-tetrazolyl
389A	CHOH	CH(Me)	-OCH ₂ -5-tetrazolyl
390A	C(Me)OH	CH(Me)	-OCH ₂ -5-tetrazolyl
391A	C(O)	CH ₂	-S(O) ₂ NH ₂
392A	CHOH	CH ₂	-S(O) ₂ NH ₂

393A	C(Me)OH	CH ₂	-S(O) ₂ NH ₂
394A	C(O)	CH(Me)	-S(O) ₂ NH ₂
395A	CHOH	CH(Me)	-S(O) ₂ NH ₂
396A	C(Me)OH	CH(Me)	-S(O) ₂ NH ₂
397A	C(O)	CH ₂	-S(O) ₂ NMe ₂
398A	CHOH	CH ₂	-S(O) ₂ NMe ₂
399A	C(Me)OH	CH ₂	-S(O) ₂ NMe ₂
400A	C(O)	CH(Me)	-S(O) ₂ NMe ₂
401A	CHOH	CH(Me)	-S(O) ₂ NMe ₂
402A	C(Me)OH	CH(Me)	-S(O) ₂ NMe ₂
403A	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Me
404A	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Me
405A	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Me
406A	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Me
407A	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Me
408A	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Me
409A	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Et
410A	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Et
411A	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ Et
412A	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Et
413A	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Et
414A	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ Et
415A	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ iPr
416A	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ iPr
417A	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ iPr
418A	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ iPr
419A	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ iPr
420A	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ iPr
421A	C(O)	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ tBu
422A	CHOH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ tBu
423A	C(Me)OH	CH ₂	-S(O) ₂ CH ₂ S(O) ₂ tBu

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424A	C(O)	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ tBu
425A	CHOH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ tBu
426A	C(Me)OH	CH(Me)	-S(O) ₂ CH ₂ S(O) ₂ tBu
427A	C(O)	CH ₂	-NHS(O) ₂ Me
428A	CHOH	CH ₂	-NHS(O) ₂ Me
429A	C(Me)OH	CH ₂	-NHS(O) ₂ Me
430A	C(O)	CH(Me)	-NHS(O) ₂ Me
431A	CHOH	CH(Me)	-NHS(O) ₂ Me
432A	C(Me)OH	CH(Me)	-NHS(O) ₂ Me
433A	C(O)	CH ₂	-NHS(O) ₂ Et
434A	CHOH	CH ₂	-NHS(O) ₂ Et
435A	C(Me)OH	CH ₂	-NHS(O) ₂ Et
436A	C(O)	CH(Me)	-NHS(O) ₂ Et
437A	CHOH	CH(Me)	-NHS(O) ₂ Et
438A	C(Me)OH	CH(Me)	-NHS(O) ₂ Et
439A	C(O)	CH ₂	-NHS(O) ₂ iPr
440A	CHOH	CH ₂	-NHS(O) ₂ iPr
441A	C(Me)OH	CH ₂	-NHS(O) ₂ iPr
442A	C(O)	CH(Me)	-NHS(O) ₂ iPr
443A	CHOH	CH(Me)	-NHS(O) ₂ iPr
444A	C(Me)OH	CH(Me)	-NHS(O) ₂ iPr
445A	C(O)	CH ₂	-NHS(O) ₂ tBu
446A	CHOH	CH ₂	-NHS(O) ₂ tBu
447A	C(Me)OH	CH ₂	-NHS(O) ₂ tBu
448A	C(O)	CH(Me)	-NHS(O) ₂ tBu
449A	CHOH	CH(Me)	-NHS(O) ₂ tBu
450A	C(Me)OH	CH(Me)	-NHS(O) ₂ tBu
451A	C(O)	CH ₂	-OS(O) ₂ Me
452A	CHOH	CH ₂	-OS(O) ₂ Me
453A	C(Me)OH	CH ₂	-OS(O) ₂ Me
454A	C(O)	CH(Me)	-OS(O) ₂ Me

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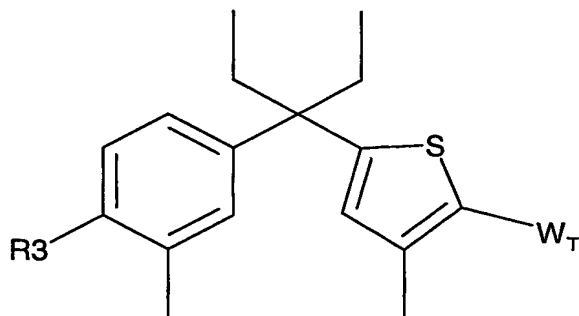
455A	CHOH	CH(Me)	-OS(O)2Me
456A	C(Me)OH	CH(Me)	-OS(O)2Me
457A	C(O)	CH2	-OS(O)2Et
458A	CHOH	CH2	-OS(O)2Et
459A	C(Me)OH	CH2	-OS(O)2Et
460A	C(O)	CH(Me)	-OS(O)2Et
461A	CHOH	CH(Me)	-OS(O)2Et
462A	C(Me)OH	CH(Me)	-OS(O)2Et
463A	C(O)	CH2	-OS(O)2iPr
464A	CHOH	CH2	-OS(O)2iPr
465A	C(Me)OH	CH2	-OS(O)2iPr
466A	C(O)	CH(Me)	-OS(O)2iPr
467A	CHOH	CH(Me)	-OS(O)2iPr
468A	C(Me)OH	CH(Me)	-OS(O)2iPr
469A	C(O)	CH2	-OS(O)2tBu
470A	CHOH	CH2	-OS(O)2tBu
471A	C(Me)OH	CH2	-OS(O)2tBu
472A	C(O)	CH(Me)	-OS(O)2tBu
473A	CHOH	CH(Me)	-OS(O)2tBu
474A	C(Me)OH	CH(Me)	-OS(O)2tBu
475A	C(O)	CH2	-NHC(O)NMe2
476A	CHOH	CH2	-NHC(O)NMe2
477A	C(Me)OH	CH2	-NHC(O)NMe2
478A	C(O)	CH(Me)	-NHC(O)NMe2
479A	CHOH	CH(Me)	-NHC(O)NMe2
480A	C(Me)OH	CH(Me)	-NHC(O)NMe2
481A	C(O)	CH2	-NHC(S)NMe2
482A	CHOH	CH2	-NHC(S)NMe2
483A	C(Me)OH	CH2	-NHC(S)NMe2
484A	C(O)	CH(Me)	-NHC(S)NMe2
485A	CHOH	CH(Me)	-NHC(S)NMe2

486A	C(Me)OH	CH(Me)	-NHC(S)NMe ₂
487A	C(O)	CH ₂	-OC(O)NMe ₂
488A	CHOH	CH ₂	-OC(O)NMe ₂
489A	C(Me)OH	CH ₂	-OC(O)NMe ₂
490A	C(O)	CH(Me)	-OC(O)NMe ₂
491A	CHOH	CH(Me)	-OC(O)NMe ₂
492A	C(Me)OH	CH(Me)	-OC(O)NMe ₂
493A	C(O)	CH ₂	-OC(S)NMe ₂
494A	CHOH	CH ₂	-OC(S)NMe ₂
495A	C(Me)OH	CH ₂	-OC(S)NMe ₂
496A	C(O)	CH(Me)	-OC(S)NMe ₂
497A	CHOH	CH(Me)	-OC(S)NMe ₂
498A	C(Me)OH	CH(Me)	-OC(S)NMe ₂
499A	C(O)	CH ₂	-NHS(O) ₂ NMe ₂
500A	CHOH	CH ₂	-NHS(O) ₂ NMe ₂
501A	C(Me)OH	CH ₂	-NHS(O) ₂ NMe ₂
502A	C(O)	CH(Me)	-NHS(O) ₂ NMe ₂
503A	CHOH	CH(Me)	-NHS(O) ₂ NMe ₂
504A	C(Me)OH	CH(Me)	-NHS(O) ₂ NMe ₂
505A	C(O)	CH ₂	-C(O)NHCH ₂ CO ₂ H
506A	CHOH	CH ₂	-C(O)NHCH ₂ CO ₂ H
507A	C(Me)OH	CH ₂	-C(O)NHCH ₂ CO ₂ H
508A	C(O)	CH(Me)	-C(O)NHCH ₂ CO ₂ H
509A	CHOH	CH(Me)	-C(O)NHCH ₂ CO ₂ H
510A	C(Me)OH	CH(Me)	-C(O)NHCH ₂ CO ₂ H
511A	C(O)	CH ₂	-SO ₂ NHCH ₂ CO ₂ H
512A	CHOH	CH ₂	-SO ₂ NHCH ₂ CO ₂ H
513A	C(Me)OH	CH ₂	-SO ₂ NHCH ₂ CO ₂ H
514A	C(O)	CH(Me)	-SO ₂ NHCH ₂ CO ₂ H
515A	CHOH	CH(Me)	-SO ₂ NHCH ₂ CO ₂ H
516A	C(Me)OH	CH(Me)	-SO ₂ NHCH ₂ CO ₂ H

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517A	C(O)	CH ₂	-CH ₂ -S-Me
518A	CHOH	CH ₂	-CH ₂ -S-Me
519A	C(Me)OH	CH ₂	-CH ₂ -S-Me
520A	C(O)	CH(Me)	-CH ₂ -S-Me
521A	CHOH	CH(Me)	-CH ₂ -S-Me
522A	C(Me)OH	CH(Me)	-CH ₂ -S-Me

Table 3



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Code	R ₃	W _T
1B	3Me3OH-Pentyl	-CO ₂ Me
2B	3Me3OH-Pentenyl	-CO ₂ Me
3B	3Me3OH-Pentynyl	-CO ₂ Me
4B	3Et3OH-Pentyl	-CO ₂ Me
5B	3Et3OH-Pentenyl	-CO ₂ Me
6B	3Et3OH-Pentynyl	-CO ₂ Me
7B	3Me3OH-Pentyl	-CO ₂ H
8B	3Me3OH-Pentenyl	-CO ₂ H
9B	3Me3OH-Pentynyl	-CO ₂ H
10B	3Et3OH-Pentyl	-CO ₂ H
11B	3Et3OH-Pentenyl	-CO ₂ H
12B	3Et3OH-Pentynyl	-CO ₂ H

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13B	3Me3OH-Pentyl	-C(O)NH ₂
14B	3Me3OH-Pentenyl	-C(O)NH ₂
15B	3Me3OH-Pentynyl	-C(O)NH ₂
16B	3Et3OH-Pentyl	-C(O)NH ₂
17B	3Et3OH-Pentenyl	-C(O)NH ₂
18B	3Et3OH-Pentynyl	-C(O)NH ₂
19B	3Me3OH-Pentyl	-C(O)NMe ₂
20B	3Me3OH-Pentenyl	-C(O)NMe ₂
21B	3Me3OH-Pentynyl	-C(O)NMe ₂
22B	3Et3OH-Pentyl	-C(O)NMe ₂
23B	3Et3OH-Pentenyl	-C(O)NMe ₂
24B	3Et3OH-Pentynyl	-C(O)NMe ₂
25B	3Me3OH-Pentyl	5-tetrazolyl
26B	3Me3OH-Pentenyl	5-tetrazolyl
27B	3Me3OH-Pentynyl	5-tetrazolyl
28B	3Et3OH-Pentyl	5-tetrazolyl
29B	3Et3OH-Pentenyl	5-tetrazolyl
30B	3Et3OH-Pentynyl	5-tetrazolyl
31B	3Me3OH-Pentyl	-C(O)-NH-5-tetrazolyl
32B	3Me3OH-Pentenyl	-C(O)-NH-5-tetrazolyl
33B	3Me3OH-Pentynyl	-C(O)-NH-5-tetrazolyl
34B	3Et3OH-Pentyl	-C(O)-NH-5-tetrazolyl
35B	3Et3OH-Pentenyl	-C(O)-NH-5-tetrazolyl
36B	3Et3OH-Pentynyl	-C(O)-NH-5-tetrazolyl
37B	3Me3OH-Pentyl	-C(O)NHCH ₂ SO ₂ Me
38B	3Me3OH-Pentenyl	-C(O)NHCH ₂ SO ₂ Me
39B	3Me3OH-Pentynyl	-C(O)NHCH ₂ SO ₂ Me
40B	3Et3OH-Pentyl	-C(O)NHCH ₂ SO ₂ Me
41B	3Et3OH-Pentenyl	-C(O)NHCH ₂ SO ₂ Me
42B	3Et3OH-Pentynyl	-C(O)NHCH ₂ SO ₂ Me
43B	3Me3OH-Pentyl	-C(O)NHCH ₂ CH ₂ SO ₂ Me

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44B	3Me3OH-Pentenyl	-C(O)NHCH ₂ CH ₂ SO ₂ Me
45B	3Me3OH-Pentynyl	-C(O)NHCH ₂ CH ₂ SO ₂ Me
46B	3Et3OH-Pentyl	-C(O)NHCH ₂ CH ₂ SO ₂ Me
47B	3Et3OH-Pentenyl	-C(O)NHCH ₂ CH ₂ SO ₂ Me
48B	3Et3OH-Pentynyl	-C(O)NHCH ₂ CH ₂ SO ₂ Me
49B	3Me3OH-Pentyl	-C(O)NHSO ₂ Me
50B	3Me3OH-Pentenyl	-C(O)NHSO ₂ Me
51B	3Me3OH-Pentynyl	-C(O)NHSO ₂ Me
52B	3Et3OH-Pentyl	-C(O)NHSO ₂ Me
53B	3Et3OH-Pentenyl	-C(O)NHSO ₂ Me
54B	3Et3OH-Pentynyl	-C(O)NHSO ₂ Me
55B	3Me3OH-Pentyl	-CH ₂ -C(O)NHSO ₂ Et
56B	3Me3OH-Pentenyl	-CH ₂ -C(O)NHSO ₂ Et
57B	3Me3OH-Pentynyl	-CH ₂ -C(O)NHSO ₂ Et
58B	3Et3OH-Pentyl	-CH ₂ -C(O)NHSO ₂ Et
59B	3Et3OH-Pentenyl	-CH ₂ -C(O)NHSO ₂ Et
60B	3Et3OH-Pentynyl	-CH ₂ -C(O)NHSO ₂ Et
61B	3Me3OH-Pentyl	-CH ₂ -C(O)NHSO ₂ iPr
62B	3Me3OH-Pentenyl	-CH ₂ -C(O)NHSO ₂ iPr
63B	3Me3OH-Pentynyl	-CH ₂ -C(O)NHSO ₂ iPr
64B	3Et3OH-Pentyl	-CH ₂ -C(O)NHSO ₂ iPr
65B	3Et3OH-Pentenyl	-CH ₂ -C(O)NHSO ₂ iPr
66B	3Et3OH-Pentynyl	-CH ₂ -C(O)NHSO ₂ iPr
67B	3Me3OH-Pentyl	-CH ₂ -C(O)NHSO ₂ tBu
68B	3Me3OH-Pentenyl	-CH ₂ -C(O)NHSO ₂ tBu
69B	3Me3OH-Pentynyl	-CH ₂ -C(O)NHSO ₂ tBu
70B	3Et3OH-Pentyl	-CH ₂ -C(O)NHSO ₂ tBu
71B	3Et3OH-Pentenyl	-CH ₂ -C(O)NHSO ₂ tBu
72B	3Et3OH-Pentynyl	-CH ₂ -C(O)NHSO ₂ tBu
73B	3Me3OH-Pentyl	-CH ₂ NHSO ₂ Me
74B	3Me3OH-Pentenyl	-CH ₂ NHSO ₂ Me

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75B	3Me3OH-Pentynyl	-CH ₂ NHSO ₂ Me
76B	3Et3OH-Pentyl	-CH ₂ NHSO ₂ Me
77B	3Et3OH-Pentenyl	-CH ₂ NHSO ₂ Me
78B	3Et3OH-Pentynyl	-CH ₂ NHSO ₂ Me
79B	3Me3OH-Pentyl	-CH ₂ NHSO ₂ Et
80B	3Me3OH-Pentenyl	-CH ₂ NHSO ₂ Et
81B	3Me3OH-Pentynyl	-CH ₂ NHSO ₂ Et
82B	3Et3OH-Pentyl	-CH ₂ NHSO ₂ Et
83B	3Et3OH-Pentenyl	-CH ₂ NHSO ₂ Et
84B	3Et3OH-Pentynyl	-CH ₂ NHSO ₂ Et
85B	3Me3OH-Pentyl	-CH ₂ NHSO ₂ iPr
86B	3Me3OH-Pentenyl	-CH ₂ NHSO ₂ iPr
87B	3Me3OH-Pentynyl	-CH ₂ NHSO ₂ iPr
88B	3Et3OH-Pentyl	-CH ₂ NHSO ₂ iPr
89B	3Et3OH-Pentenyl	-CH ₂ NHSO ₂ iPr
90B	3Et3OH-Pentynyl	-CH ₂ NHSO ₂ iPr
91B	3Me3OH-Pentyl	-CH ₂ NHSO ₂ tBu
92B	3Me3OH-Pentenyl	-CH ₂ NHSO ₂ tBu
93B	3Me3OH-Pentynyl	-CH ₂ NHSO ₂ tBu
94B	3Et3OH-Pentyl	-CH ₂ NHSO ₂ tBu
95B	3Et3OH-Pentenyl	-CH ₂ NHSO ₂ tBu
96B	3Et3OH-Pentynyl	-CH ₂ NHSO ₂ tBu
97B	3Me3OH-Pentyl	-CH ₂ -N-pyrrolidin-2-one
98B	3Me3OH-Pentenyl	-CH ₂ -N-pyrrolidin-2-one
99B	3Me3OH-Pentynyl	-CH ₂ -N-pyrrolidin-2-one
100B	3Et3OH-Pentyl	-CH ₂ -N-pyrrolidin-2-one
101B	3Et3OH-Pentenyl	-CH ₂ -N-pyrrolidin-2-one
102B	3Et3OH-Pentynyl	-CH ₂ -N-pyrrolidin-2-one
103B	3Me3OH-Pentyl	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
104B	3Me3OH-Pentenyl	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)

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105B	3Me3OH-Pentynyl	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
106B	3Et3OH-Pentyl	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
107B	3Et3OH-Pentenyl	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
108B	3Et3OH-Pentynyl	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
109B	3Me3OH-Pentyl	-CH ₂ CO ₂ Me
110B	3Me3OH-Pentenyl	-CH ₂ CO ₂ Me
111B	3Me3OH-Pentynyl	-CH ₂ CO ₂ Me
112B	3Et3OH-Pentyl	-CH ₂ CO ₂ Me
113B	3Et3OH-Pentenyl	-CH ₂ CO ₂ Me
114B	3Et3OH-Pentynyl	-CH ₂ CO ₂ Me
115B	3Me3OH-Pentyl	-CH ₂ CO ₂ H
116B	3Me3OH-Pentenyl	-CH ₂ CO ₂ H
117B	3Me3OH-Pentynyl	-CH ₂ CO ₂ H
118B	3Et3OH-Pentyl	-CH ₂ CO ₂ H
119B	3Et3OH-Pentenyl	-CH ₂ CO ₂ H
120B	3Et3OH-Pentynyl	-CH ₂ CO ₂ H
121B	3Me3OH-Pentyl	-CH ₂ C(O)NH ₂
122B	3Me3OH-Pentenyl	-CH ₂ C(O)NH ₂
123B	3Me3OH-Pentynyl	-CH ₂ C(O)NH ₂
124B	3Et3OH-Pentyl	-CH ₂ C(O)NH ₂
125B	3Et3OH-Pentenyl	-CH ₂ C(O)NH ₂
126B	3Et3OH-Pentynyl	-CH ₂ C(O)NH ₂
127B	3Me3OH-Pentyl	-CH ₂ C(O)NMe ₂
128B	3Me3OH-Pentenyl	-CH ₂ C(O)NMe ₂
129B	3Me3OH-Pentynyl	-CH ₂ C(O)NMe ₂
130B	3Et3OH-Pentyl	-CH ₂ C(O)NMe ₂
131B	3Et3OH-Pentenyl	-CH ₂ C(O)NMe ₂

132B	3Et3OH-Pentynyl	-CH ₂ C(O)NMe ₂
133B	3Me3OH-Pentyl	-CH ₂ C(O)-N-pyrrolidine
134B	3Me3OH-Pentenyl	-CH ₂ C(O)-N-pyrrolidine
135B	3Me3OH-Pentynyl	-CH ₂ C(O)-N-pyrrolidine
136B	3Et3OH-Pentyl	-CH ₂ C(O)-N-pyrrolidine
137B	3Et3OH-Pentenyl	-CH ₂ C(O)-N-pyrrolidine
138B	3Et3OH-Pentynyl	-CH ₂ C(O)-N-pyrrolidine
139B	3Me3OH-Pentyl	-CH ₂ -5-tetrazolyl
140B	3Me3OH-Pentenyl	-CH ₂ -5-tetrazolyl
141B	3Me3OH-Pentynyl	-CH ₂ -5-tetrazolyl
142B	3Et3OH-Pentyl	-CH ₂ -5-tetrazolyl
143B	3Et3OH-Pentenyl	-CH ₂ -5-tetrazolyl
144B	3Et3OH-Pentynyl	-CH ₂ -5-tetrazolyl
145B	3Me3OH-Pentyl	-C(O)C(O)OH
146B	3Me3OH-Pentenyl	-C(O)C(O)OH
147B	3Me3OH-Pentynyl	-C(O)C(O)OH
148B	3Et3OH-Pentyl	-C(O)C(O)OH
149B	3Et3OH-Pentenyl	-C(O)C(O)OH
150B	3Et3OH-Pentynyl	-C(O)C(O)OH
151B	3Me3OH-Pentyl	-CH(OH)C(O)OH
152B	3Me3OH-Pentenyl	-CH(OH)C(O)OH
153B	3Me3OH-Pentynyl	-CH(OH)C(O)OH
154B	3Et3OH-Pentyl	-CH(OH)C(O)OH
155B	3Et3OH-Pentenyl	-CH(OH)C(O)OH
156B	3Et3OH-Pentynyl	-CH(OH)C(O)OH
157B	3Me3OH-Pentyl	-C(O)C(O)NH ₂
158B	3Me3OH-Pentenyl	-C(O)C(O)NH ₂
159B	3Me3OH-Pentynyl	-C(O)C(O)NH ₂
160B	3Et3OH-Pentyl	-C(O)C(O)NH ₂
161B	3Et3OH-Pentenyl	-C(O)C(O)NH ₂
162B	3Et3OH-Pentynyl	-C(O)C(O)NH ₂

163B	3Me3OH-Pentyl	-CH(OH)C(O)NH ₂
164B	3Me3OH-Pentenyl	-CH(OH)C(O)NH ₂
165B	3Me3OH-Pentynyl	-CH(OH)C(O)NH ₂
166B	3Et3OH-Pentyl	-CH(OH)C(O)NH ₂
167B	3Et3OH-Pentenyl	-CH(OH)C(O)NH ₂
168B	3Et3OH-Pentynyl	-CH(OH)C(O)NH ₂
169B	3Me3OH-Pentyl	-C(O)C(O)NMe ₂
170B	3Me3OH-Pentenyl	-C(O)C(O)NMe ₂
171B	3Me3OH-Pentynyl	-C(O)C(O)NMe ₂
172B	3Et3OH-Pentyl	-C(O)C(O)NMe ₂
173B	3Et3OH-Pentenyl	-C(O)C(O)NMe ₂
174B	3Et3OH-Pentynyl	-C(O)C(O)NMe ₂
175B	3Me3OH-Pentyl	-CH(OH)C(O)NMe ₂
176B	3Me3OH-Pentenyl	-CH(OH)C(O)NMe ₂
177B	3Me3OH-Pentynyl	-CH(OH)C(O)NMe ₂
178B	3Et3OH-Pentyl	-CH(OH)C(O)NMe ₂
179B	3Et3OH-Pentenyl	-CH(OH)C(O)NMe ₂
180B	3Et3OH-Pentynyl	-CH(OH)C(O)NMe ₂
181B	3Me3OH-Pentyl	-CH ₂ CH ₂ CO ₂ H
182B	3Me3OH-Pentenyl	-CH ₂ CH ₂ CO ₂ H
183B	3Me3OH-Pentynyl	-CH ₂ CH ₂ CO ₂ H
184B	3Et3OH-Pentyl	-CH ₂ CH ₂ CO ₂ H
185B	3Et3OH-Pentenyl	-CH ₂ CH ₂ CO ₂ H
186B	3Et3OH-Pentynyl	-CH ₂ CH ₂ CO ₂ H
187B	3Me3OH-Pentyl	-CH ₂ CH ₂ C(O)NH ₂
188B	3Me3OH-Pentenyl	-CH ₂ CH ₂ C(O)NH ₂
189B	3Me3OH-Pentynyl	-CH ₂ CH ₂ C(O)NH ₂
190B	3Et3OH-Pentyl	-CH ₂ CH ₂ C(O)NH ₂
191B	3Et3OH-Pentenyl	-CH ₂ CH ₂ C(O)NH ₂
192B	3Et3OH-Pentynyl	-CH ₂ CH ₂ C(O)NH ₂
193B	3Me3OH-Pentyl	-CH ₂ CH ₂ C(O)NMe ₂

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194B	3Me3OH-Pentenyl	-CH ₂ CH ₂ C(O)NMe ₂
195B	3Me3OH-Pentynyl	-CH ₂ CH ₂ C(O)NMe ₂
196B	3Et3OH-Pentyl	-CH ₂ CH ₂ C(O)NMe ₂
197B	3Et3OH-Pentenyl	-CH ₂ CH ₂ C(O)NMe ₂
198B	3Et3OH-Pentynyl	-CH ₂ CH ₂ C(O)NMe ₂
199B	3Me3OH-Pentyl	-CH ₂ CH ₂ -5-tetrazolyl
200B	3Me3OH-Pentenyl	-CH ₂ CH ₂ -5-tetrazolyl
201B	3Me3OH-Pentynyl	-CH ₂ CH ₂ -5-tetrazolyl
202B	3Et3OH-Pentyl	-CH ₂ CH ₂ -5-tetrazolyl
203B	3Et3OH-Pentenyl	-CH ₂ CH ₂ -5-tetrazolyl
204B	3Et3OH-Pentynyl	-CH ₂ CH ₂ -5-tetrazolyl
205B	3Me3OH-Pentyl	-CH ₂ S(O) ₂ Me
206B	3Me3OH-Pentenyl	-CH ₂ S(O) ₂ Me
207B	3Me3OH-Pentynyl	-CH ₂ S(O) ₂ Me
208B	3Et3OH-Pentyl	-CH ₂ S(O) ₂ Me
209B	3Et3OH-Pentenyl	-CH ₂ S(O) ₂ Me
210B	3Et3OH-Pentynyl	-CH ₂ S(O) ₂ Me
211B	3Me3OH-Pentyl	-CH ₂ CH ₂ S(O) ₂ Me
212B	3Me3OH-Pentenyl	-CH ₂ CH ₂ S(O) ₂ Me
213B	3Me3OH-Pentynyl	-CH ₂ CH ₂ S(O) ₂ Me
214B	3Et3OH-Pentyl	-CH ₂ CH ₂ S(O) ₂ Me
215B	3Et3OH-Pentenyl	-CH ₂ CH ₂ S(O) ₂ Me
216B	3Et3OH-Pentynyl'	-CH ₂ CH ₂ S(O) ₂ Me
217B	3Me3OH-Pentyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
218B	3Me3OH-Pentenyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
219B	3Me3OH-Pentynyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
220B	3Et3OH-Pentyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
221B	3Et3OH-Pentenyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
222B	3Et3OH-Pentynyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
223B	3Me3OH-Pentyl	-CH ₂ S(O) ₂ Et
224B	3Me3OH-Pentenyl	-CH ₂ S(O) ₂ Et

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225B	3Me3OH-Pentynyl	-CH ₂ S(O) ₂ Et
226B	3Et3OH-Pentyl	-CH ₂ S(O) ₂ Et
227B	3Et3OH-Pentenyl	-CH ₂ S(O) ₂ Et
228B	3Et3OH-Pentynyl	-CH ₂ S(O) ₂ Et
229B	3Me3OH-Pentyl	-CH ₂ CH ₂ S(O) ₂ Et
230B	3Me3OH-Pentenyl	-CH ₂ CH ₂ S(O) ₂ Et
231B	3Me3OH-Pentynyl	-CH ₂ CH ₂ S(O) ₂ Et
232B	3Et3OH-Pentyl	-CH ₂ CH ₂ S(O) ₂ Et
233B	3Et3OH-Pentenyl	-CH ₂ CH ₂ S(O) ₂ Et
234B	3Et3OH-Pentynyl	-CH ₂ CH ₂ S(O) ₂ Et
235B	3Me3OH-Pentyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
236B	3Me3OH-Pentenyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
237B	3Me3OH-Pentynyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
238B	3Et3OH-Pentyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
239B	3Et3OH-Pentenyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
240B	3Et3OH-Pentynyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
241B	3Me3OH-Pentyl	-CH ₂ S(O) ₂ iPr
242B	3Me3OH-Pentenyl	-CH ₂ S(O) ₂ iPr
243B	3Me3OH-Pentynyl	-CH ₂ S(O) ₂ iPr
244B	3Et3OH-Pentyl	-CH ₂ S(O) ₂ iPr
245B	3Et3OH-Pentenyl	-CH ₂ S(O) ₂ iPr
246B	3Et3OH-Pentynyl	-CH ₂ S(O) ₂ iPr
247B	3Me3OH-Pentyl	-CH ₂ CH ₂ S(O) ₂ iPr
248B	3Me3OH-Pentenyl	-CH ₂ CH ₂ S(O) ₂ iPr
249B	3Me3OH-Pentynyl	-CH ₂ CH ₂ S(O) ₂ iPr
250B	3Et3OH-Pentyl	-CH ₂ CH ₂ S(O) ₂ iPr
251B	3Et3OH-Pentenyl	-CH ₂ CH ₂ S(O) ₂ iPr
252B	3Et3OH-Pentynyl	-CH ₂ CH ₂ S(O) ₂ iPr
253B	3Me3OH-Pentyl	-CH ₂ S(O) ₂ tBu
254B	3Me3OH-Pentenyl	-CH ₂ S(O) ₂ tBu
255B	3Me3OH-Pentynyl	-CH ₂ S(O) ₂ tBu

256B	3Et3OH-Pentyl	-CH ₂ S(O)2tBu
257B	3Et3OH-Pentenyl	-CH ₂ S(O)2tBu
258B	3Et3OH-Pentynyl	-CH ₂ S(O)2tBu
259B	3Me3OH-Pentyl	-CH ₂ CH ₂ S(O)2tBu
260B	3Me3OH-Pentenyl	-CH ₂ CH ₂ S(O)2tBu
261B	3Me3OH-Pentynyl	-CH ₂ CH ₂ S(O)2tBu
262B	3Et3OH-Pentyl	-CH ₂ CH ₂ S(O)2tBu
263B	3Et3OH-Pentenyl	-CH ₂ CH ₂ S(O)2tBu
264B	3Et3OH-Pentynyl	-CH ₂ CH ₂ S(O)2tBu
265B	3Me3OH-Pentyl	-CH ₂ CH ₂ S(O)2NH ₂
266B	3Me3OH-Pentenyl	-CH ₂ CH ₂ S(O)2NH ₂
267B	3Me3OH-Pentynyl	-CH ₂ CH ₂ S(O)2NH ₂
268B	3Et3OH-Pentyl	-CH ₂ CH ₂ S(O)2NH ₂
269B	3Et3OH-Pentenyl	-CH ₂ CH ₂ S(O)2NH ₂
270B	3Et3OH-Pentynyl	-CH ₂ CH ₂ S(O)2NH ₂
271B	3Me3OH-Pentyl	-CH ₂ CH ₂ S(O)2NMe ₂
272B	3Me3OH-Pentenyl	-CH ₂ CH ₂ S(O)2NMe ₂
273B	3Me3OH-Pentynyl	-CH ₂ CH ₂ S(O)2NMe ₂
274B	3Et3OH-Pentyl	-CH ₂ CH ₂ S(O)2NMe ₂
275B	3Et3OH-Pentenyl	-CH ₂ CH ₂ S(O)2NMe ₂
276B	3Et3OH-Pentynyl	-CH ₂ CH ₂ S(O)2NMe ₂
277B	3Me3OH-Pentyl	-C(O)CH ₂ S(O)2Me
278B	3Me3OH-Pentenyl	-C(O)CH ₂ S(O)2Me
279B	3Me3OH-Pentynyl	-C(O)CH ₂ S(O)2Me
280B	3Et3OH-Pentyl	-C(O)CH ₂ S(O)2Me
281B	3Et3OH-Pentenyl	-C(O)CH ₂ S(O)2Me
282B	3Et3OH-Pentynyl	-C(O)CH ₂ S(O)2Me
283B	3Me3OH-Pentyl	-C(O)CH ₂ CH ₂ S(O)2Me
284B	3Me3OH-Pentenyl	-C(O)CH ₂ CH ₂ S(O)2Me
285B	3Me3OH-Pentynyl	-C(O)CH ₂ CH ₂ S(O)2Me
286B	3Et3OH-Pentyl	-C(O)CH ₂ CH ₂ S(O)2Me

287B	3Et3OH-Pentenyl	-C(O)CH ₂ CH ₂ S(O) ₂ Me
288B	3Et3OH-Pentynyl	-C(O)CH ₂ CH ₂ S(O) ₂ Me
289B	3Me3OH-Pentyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
290B	3Me3OH-Pentenyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
291B	3Me3OH-Pentynyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
292B	3Et3OH-Pentyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
293B	3Et3OH-Pentenyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
294B	3Et3OH-Pentynyl	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
295B	3Me3OH-Pentyl	-S(O) ₂ Me
296B	3Me3OH-Pentenyl	-S(O) ₂ Me
297B	3Me3OH-Pentynyl	-S(O) ₂ Me
298B	3Et3OH-Pentyl	-S(O) ₂ Me
299B	3Et3OH-Pentenyl	-S(O) ₂ Me
300B	3Et3OH-Pentynyl	-S(O) ₂ Me
301B	3Me3OH-Pentyl	-S(O) ₂ Et
302B	3Me3OH-Pentenyl	-S(O) ₂ Et
303B	3Me3OH-Pentynyl	-S(O) ₂ Et
304B	3Et3OH-Pentyl	-S(O) ₂ Et
305B	3Et3OH-Pentenyl	-S(O) ₂ Et
306B	3Et3OH-Pentynyl	-S(O) ₂ Et
307B	3Me3OH-Pentyl	-S(O) ₂ iPr
308B	3Me3OH-Pentenyl	-S(O) ₂ iPr
309B	3Me3OH-Pentynyl	-S(O) ₂ iPr
310B	3Et3OH-Pentyl	-S(O) ₂ iPr
311B	3Et3OH-Pentenyl	-S(O) ₂ iPr
312B	3Et3OH-Pentynyl	-S(O) ₂ iPr
313B	3Me3OH-Pentyl	-S(O) ₂ tBu
314B	3Me3OH-Pentenyl	-S(O) ₂ tBu
315B	3Me3OH-Pentynyl	-S(O) ₂ tBu
316B	3Et3OH-Pentyl	-S(O) ₂ tBu
317B	3Et3OH-Pentenyl	-S(O) ₂ tBu

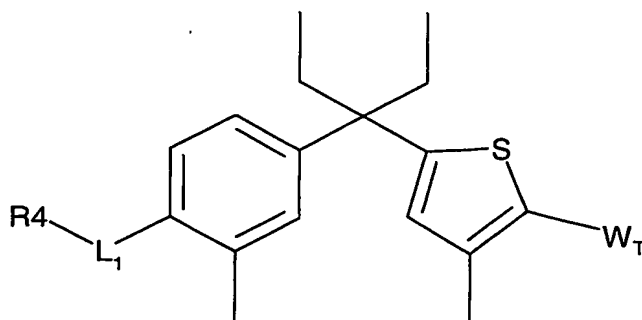
318B	3Et3OH-Pentynyl	-S(O)2tBu
319B	3Me3OH-Pentyl	-S(O)2NH2
320B	3Me3OH-Pentenyl	-S(O)2NH2
321B	3Me3OH-Pentynyl	-S(O)2NH2
322B	3Et3OH-Pentyl	-S(O)2NH2
323B	3Et3OH-Pentenyl	-S(O)2NH2
324B	3Et3OH-Pentynyl	-S(O)2NH2
325B	3Me3OH-Pentyl	-S(O)2NMe2
326B	3Me3OH-Pentenyl	-S(O)2NMe2
327B	3Me3OH-Pentynyl	-S(O)2NMe2
328B	3Et3OH-Pentyl	-S(O)2NMe2
329B	3Et3OH-Pentenyl	-S(O)2NMe2
330B	3Et3OH-Pentynyl	-S(O)2NMe2
331B	3Me3OH-Pentyl	-S(O)2CH2S(O)2Me
332B	3Me3OH-Pentenyl	-S(O)2CH2S(O)2Me
333B	3Me3OH-Pentynyl	-S(O)2CH2S(O)2Me
334B	3Et3OH-Pentyl	-S(O)2CH2S(O)2Me
335B	3Et3OH-Pentenyl	-S(O)2CH2S(O)2Me
336B	3Et3OH-Pentynyl	-S(O)2CH2S(O)2Me
337B	3Me3OH-Pentyl	-S(O)2CH2S(O)2Et
338B	3Me3OH-Pentenyl	-S(O)2CH2S(O)2Et
339B	3Me3OH-Pentynyl	-S(O)2CH2S(O)2Et
340B	3Et3OH-Pentyl	-S(O)2CH2S(O)2Et
341B	3Et3OH-Pentenyl	-S(O)2CH2S(O)2Et
342B	3Et3OH-Pentynyl	-S(O)2CH2S(O)2Et
343B	3Me3OH-Pentyl	-S(O)2CH2S(O)2iPr
344B	3Me3OH-Pentenyl	-S(O)2CH2S(O)2iPr
345B	3Me3OH-Pentynyl	-S(O)2CH2S(O)2iPr
346B	3Et3OH-Pentyl	-S(O)2CH2S(O)2iPr
347B	3Et3OH-Pentenyl	-S(O)2CH2S(O)2iPr
348B	3Et3OH-Pentynyl	-S(O)2CH2S(O)2iPr

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349B	3Me3OH-Pentyl	-S(O)2CH2S(O)2tBu
350B	3Me3OH-Pentenyl	-S(O)2CH2S(O)2tBu
351B	3Me3OH-Pentynyl	-S(O)2CH2S(O)2tBu
352B	3Et3OH-Pentyl	-S(O)2CH2S(O)2tBu
353B	3Et3OH-Pentenyl	-S(O)2CH2S(O)2tBu
354B	3Et3OH-Pentynyl	-S(O)2CH2S(O)2tBu
355B	3Me3OH-Pentyl	-C(O)NHCH2CO2H
356B	3Me3OH-Pentenyl	-C(O)NHCH2CO2H
357B	3Me3OH-Pentynyl	-C(O)NHCH2CO2H
358B	3Et3OH-Pentyl	-C(O)NHCH2CO2H
359B	3Et3OH-Pentenyl	-C(O)NHCH2CO2H
360B	3Et3OH-Pentynyl	-C(O)NHCH2CO2H
361B	3Me3OH-Pentyl	-SO2NHCH2CO2H
362B	3Me3OH-Pentenyl	-SO2NHCH2CO2H
363B	3Me3OH-Pentynyl	-SO2NHCH2CO2H
364B	3Et3OH-Pentyl	-SO2NHCH2CO2H
365B	3Et3OH-Pentenyl	-SO2NHCH2CO2H
366B	3Et3OH-Pentynyl	-SO2NHCH2CO2H
367B	3Me3OH-Pentyl	-CH2-S-Me
368B	3Me3OH-Pentenyl	-CH2-S-Me
369B	3Me3OH-Pentynyl	-CH2-S-Me
370B	3Et3OH-Pentyl	-CH2-S-Me
371B	3Et3OH-Pentenyl	-CH2-S-Me
372B	3Et3OH-Pentynyl	-CH2-S-Me

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Table 4



Code	R ₄	L ₁	W _T
1C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CO ₂ Me
2C	1-hydroxycyclopentyl	-C≡C-	-CO ₂ Me
3C	1-hydroxycyclopentyl	-C=C-	-CO ₂ Me
4C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CO ₂ Me
5C	1-hydroxycyclohexyl	-C≡C-	-CO ₂ Me
6C	1-hydroxycyclohexyl	-C=C-	-CO ₂ Me
7C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CO ₂ H
8C	1-hydroxycyclopentyl	-C≡C-	-CO ₂ H
9C	1-hydroxycyclopentyl	-C=C-	-CO ₂ H
10C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CO ₂ H
11C	1-hydroxycyclohexyl	-C≡C-	-CO ₂ H
12C	1-hydroxycyclohexyl	-C=C-	-CO ₂ H
13C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)NH ₂
14C	1-hydroxycyclopentyl	-C≡C-	-C(O)NH ₂
15C	1-hydroxycyclopentyl	-C=C-	-C(O)NH ₂
16C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)NH ₂
17C	1-hydroxycyclohexyl	-C≡C-	-C(O)NH ₂
18C	1-hydroxycyclohexyl	-C=C-	-C(O)NH ₂
19C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)NMe ₂
20C	1-hydroxycyclopentyl	-C≡C-	-C(O)NMe ₂
21C	1-hydroxycyclopentyl	-C=C-	-C(O)NMe ₂

22C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)NMe ₂
23C	1-hydroxycyclohexyl	-C≡C-	-C(O)NMe ₂
24C	1-hydroxycyclohexyl	-C=C-	-C(O)NMe ₂
25C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	5-tetrazolyl
26C	1-hydroxycyclopentyl	-C≡C-	5-tetrazolyl
27C	1-hydroxycyclopentyl	-C=C-	5-tetrazolyl
28C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	5-tetrazolyl
29C	1-hydroxycyclohexyl	-C≡C-	5-tetrazolyl
30C	1-hydroxycyclohexyl	-C=C-	5-tetrazolyl
31C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)-NH-5-tetrazolyl
32C	1-hydroxycyclopentyl	-C≡C-	-C(O)-NH-5-tetrazolyl
33C	1-hydroxycyclopentyl	-C=C-	-C(O)-NH-5-tetrazolyl
34C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)-NH-5-tetrazolyl
35C	1-hydroxycyclohexyl	-C≡C-	-C(O)-NH-5-tetrazolyl
36C	1-hydroxycyclohexyl	-C=C-	-C(O)-NH-5-tetrazolyl
37C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)NHCH ₂ SO ₂ Me
38C	1-hydroxycyclopentyl	-C≡C-	-C(O)NHCH ₂ SO ₂ Me
39C	1-hydroxycyclopentyl	-C=C-	-C(O)NHCH ₂ SO ₂ Me
40C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)NHCH ₂ SO ₂ Me
41C	1-hydroxycyclohexyl	-C≡C-	-C(O)NHCH ₂ SO ₂ Me
42C	1-hydroxycyclohexyl	-C=C-	-C(O)NHCH ₂ SO ₂ Me
43C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)NHCH ₂ CH ₂ SO ₂ Me
44C	1-hydroxycyclopentyl	-C≡C-	-C(O)NHCH ₂ CH ₂ SO ₂ Me
45C	1-hydroxycyclopentyl	-C=C-	-C(O)NHCH ₂ CH ₂ SO ₂ Me
46C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)NHCH ₂ CH ₂ SO ₂ Me
47C	1-hydroxycyclohexyl	-C≡C-	-C(O)NHCH ₂ CH ₂ SO ₂ Me
48C	1-hydroxycyclohexyl	-C=C-	-C(O)NHCH ₂ CH ₂ SO ₂ Me
49C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)NHSO ₂ Me
50C	1-hydroxycyclopentyl	-C≡C-	-C(O)NHSO ₂ Me
51C	1-hydroxycyclopentyl	-C=C-	-C(O)NHSO ₂ Me
52C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)NHSO ₂ Me

53C	1-hydroxycyclohexyl	-C≡C-	-C(O)NHSO ₂ Me
54C	1-hydroxycyclohexyl	-C=C-	-C(O)NHSO ₂ Me
55C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ -C(O)NHSO ₂ Et
56C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ -C(O)NHSO ₂ Et
57C	1-hydroxycyclopentyl	-C=C-	-CH ₂ -C(O)NHSO ₂ Et
58C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ -C(O)NHSO ₂ Et
59C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ -C(O)NHSO ₂ Et
60C	1-hydroxycyclohexyl	-C=C-	-CH ₂ -C(O)NHSO ₂ Et
61C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ -C(O)NHSO ₂ iPr
62C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ -C(O)NHSO ₂ iPr
63C	1-hydroxycyclopentyl	-C=C-	-CH ₂ -C(O)NHSO ₂ iPr
64C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ -C(O)NHSO ₂ iPr
65C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ -C(O)NHSO ₂ iPr
66C	1-hydroxycyclohexyl	-C=C-	-CH ₂ -C(O)NHSO ₂ iPr
67C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ -C(O)NHSO ₂ tBu
68C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ -C(O)NHSO ₂ tBu
69C	1-hydroxycyclopentyl	-C=C-	-CH ₂ -C(O)NHSO ₂ tBu
70C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ -C(O)NHSO ₂ tBu
71C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ -C(O)NHSO ₂ tBu
72C	1-hydroxycyclohexyl	-C=C-	-CH ₂ -C(O)NHSO ₂ tBu
73C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ Me
74C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ NHSO ₂ Me
75C	1-hydroxycyclopentyl	-C=C-	-CH ₂ NHSO ₂ Me
76C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ Me
77C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ NHSO ₂ Me
78C	1-hydroxycyclohexyl	-C=C-	-CH ₂ NHSO ₂ Me
79C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ Et
80C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ NHSO ₂ Et
81C	1-hydroxycyclopentyl	-C=C-	-CH ₂ NHSO ₂ Et
82C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ Et
83C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ NHSO ₂ Et

84C	1-hydroxycyclohexyl	-C=C-	-CH ₂ NHSO ₂ Et
85C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ iPr
86C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ NHSO ₂ iPr
87C	1-hydroxycyclopentyl	-C=C-	-CH ₂ NHSO ₂ iPr
88C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ iPr
89C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ NHSO ₂ iPr
90C	1-hydroxycyclohexyl	-C=C-	-CH ₂ NHSO ₂ iPr
91C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ tBu
92C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ NHSO ₂ tBu
93C	1-hydroxycyclopentyl	-C=C-	-CH ₂ NHSO ₂ tBu
94C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ NHSO ₂ tBu
95C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ NHSO ₂ tBu
96C	1-hydroxycyclohexyl	-C=C-	-CH ₂ NHSO ₂ tBu
97C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ -N-pyrrolidin-2-one
98C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ -N-pyrrolidin-2-one
99C	1-hydroxycyclopentyl	-C=C-	-CH ₂ -N-pyrrolidin-2-one
100C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ -N-pyrrolidin-2-one
101C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ -N-pyrrolidin-2-one
102C	1-hydroxycyclohexyl	-C=C-	-CH ₂ -N-pyrrolidin-2-one
103C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
104C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
105C	1-hydroxycyclopentyl	-C=C-	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
106C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
107C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
108C	1-hydroxycyclohexyl	-C=C-	-CH ₂ -(1-methylpyrrolidin-2-one-3-yl)
109C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CO ₂ Me
110C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CO ₂ Me
111C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CO ₂ Me
112C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CO ₂ Me
113C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CO ₂ Me
114C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CO ₂ Me

115C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CO ₂ H
116C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CO ₂ H
117C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CO ₂ H
118C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CO ₂ H
119C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CO ₂ H
120C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CO ₂ H
121C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ C(O)NH ₂
122C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ C(O)NH ₂
123C	1-hydroxycyclopentyl	-C=C-	-CH ₂ C(O)NH ₂
124C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ C(O)NH ₂
125C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ C(O)NH ₂
126C	1-hydroxycyclohexyl	-C=C-	-CH ₂ C(O)NH ₂
127C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ C(O)NMe ₂
128C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ C(O)NMe ₂
129C	1-hydroxycyclopentyl	-C=C-	-CH ₂ C(O)NMe ₂
130C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ C(O)NMe ₂
131C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ C(O)NMe ₂
132C	1-hydroxycyclohexyl	-C=C-	-CH ₂ C(O)NMe ₂
133C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ C(O)-N-pyrrolidine
134C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ C(O)-N-pyrrolidine
135C	1-hydroxycyclopentyl	-C=C-	-CH ₂ C(O)-N-pyrrolidine
136C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ C(O)-N-pyrrolidine
137C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ C(O)-N-pyrrolidine
138C	1-hydroxycyclohexyl	-C=C-	-CH ₂ C(O)-N-pyrrolidine
139C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ -5-tetrazolyl
140C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ -5-tetrazolyl
141C	1-hydroxycyclopentyl	-C=C-	-CH ₂ -5-tetrazolyl
142C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ -5-tetrazolyl
143C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ -5-tetrazolyl
144C	1-hydroxycyclohexyl	-C=C-	-CH ₂ -5-tetrazolyl
145C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)C(O)OH

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146C	1-hydroxycyclopentyl	-C≡C-	-C(O)C(O)OH
147C	1-hydroxycyclopentyl	-C=C-	-C(O)C(O)OH
148C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)C(O)OH
149C	1-hydroxycyclohexyl	-C≡C-	-C(O)C(O)OH
150C	1-hydroxycyclohexyl	-C=C-	-C(O)C(O)OH
151C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH(OH)C(O)OH
152C	1-hydroxycyclopentyl	-C≡C-	-CH(OH)C(O)OH
153C	1-hydroxycyclopentyl	-C=C-	-CH(OH)C(O)OH
154C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH(OH)C(O)OH
155C	1-hydroxycyclohexyl	-C≡C-	-CH(OH)C(O)OH
156C	1-hydroxycyclohexyl	-C=C-	-CH(OH)C(O)OH
157C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)C(O)NH ₂
158C	1-hydroxycyclopentyl	-C≡C-	-C(O)C(O)NH ₂
159C	1-hydroxycyclopentyl	-C=C-	-C(O)C(O)NH ₂
160C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)C(O)NH ₂
161C	1-hydroxycyclohexyl	-C≡C-	-C(O)C(O)NH ₂
162C	1-hydroxycyclohexyl	-C=C-	-C(O)C(O)NH ₂
163C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH(OH)C(O)NH ₂
164C	1-hydroxycyclopentyl	-C≡C-	-CH(OH)C(O)NH ₂
165C	1-hydroxycyclopentyl	-C=C-	-CH(OH)C(O)NH ₂
166C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH(OH)C(O)NH ₂
167C	1-hydroxycyclohexyl	-C≡C-	-CH(OH)C(O)NH ₂
168C	1-hydroxycyclohexyl	-C=C-	-CH(OH)C(O)NH ₂
169C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)C(O)NMe ₂
170C	1-hydroxycyclopentyl	-C≡C-	-C(O)C(O)NMe ₂
171C	1-hydroxycyclopentyl	-C=C-	-C(O)C(O)NMe ₂
172C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)C(O)NMe ₂
173C	1-hydroxycyclohexyl	-C≡C-	-C(O)C(O)NMe ₂
174C	1-hydroxycyclohexyl	-C=C-	-C(O)C(O)NMe ₂
175C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH(OH)C(O)NMe ₂
176C	1-hydroxycyclopentyl	-C≡C-	-CH(OH)C(O)NMe ₂

177C	1-hydroxycyclopentyl	-C=C-	-CH(OH)C(O)NMe ₂
178C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH(OH)C(O)NMe ₂
179C	1-hydroxycyclohexyl	-C≡C-	-CH(OH)C(O)NMe ₂
180C	1-hydroxycyclohexyl	-C=C-	-CH(OH)C(O)NMe ₂
181C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CO ₂ H
182C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ CO ₂ H
183C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ CO ₂ H
184C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CO ₂ H
185C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ CO ₂ H
186C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ CO ₂ H
187C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ C(O)NH ₂
188C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ C(O)NH ₂
189C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ C(O)NH ₂
190C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ C(O)NH ₂
191C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ C(O)NH ₂
192C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ C(O)NH ₂
193C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ C(O)NMe ₂
194C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ C(O)NMe ₂
195C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ C(O)NMe ₂
196C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ C(O)NMe ₂
197C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ C(O)NMe ₂
198C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ C(O)NMe ₂
199C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ -5-tetrazolyl
200C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ -5-tetrazolyl
201C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ -5-tetrazolyl
202C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ -5-tetrazolyl
203C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ -5-tetrazolyl
204C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ -5-tetrazolyl
205C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ Me
206C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ S(O) ₂ Me
207C	1-hydroxycyclopentyl	-C=C-	-CH ₂ S(O) ₂ Me

208C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ Me
209C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ S(O) ₂ Me
210C	1-hydroxycyclohexyl	-C=C-	-CH ₂ S(O) ₂ Me
211C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ Me
212C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ Me
213C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ Me
214C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ Me
215C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ Me
216C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ Me
217C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
218C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
219C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
220C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
221C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
222C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Me
223C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ Et
224C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ S(O) ₂ Et
225C	1-hydroxycyclopentyl	-C=C-	-CH ₂ S(O) ₂ Et
226C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ Et
227C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ S(O) ₂ Et
228C	1-hydroxycyclohexyl	-C=C-	-CH ₂ S(O) ₂ Et
229C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ Et
230C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ Et
231C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ Et
232C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ Et
233C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ Et
234C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ Et
235C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
236C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
237C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
238C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et

239C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
240C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ Et
241C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ iPr
242C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ S(O) ₂ iPr
243C	1-hydroxycyclopentyl	-C=C-	-CH ₂ S(O) ₂ iPr
244C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ iPr
245C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ S(O) ₂ iPr
246C	1-hydroxycyclohexyl	-C=C-	-CH ₂ S(O) ₂ iPr
247C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ iPr
248C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ iPr
249C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ iPr
250C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ iPr
251C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ iPr
252C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ iPr
253C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ tBu
254C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ S(O) ₂ tBu
255C	1-hydroxycyclopentyl	-C=C-	-CH ₂ S(O) ₂ tBu
256C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ S(O) ₂ tBu
257C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ S(O) ₂ tBu
258C	1-hydroxycyclohexyl	-C=C-	-CH ₂ S(O) ₂ tBu
259C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ tBu
260C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ tBu
261C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ tBu
262C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ tBu
263C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ tBu
264C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ tBu
265C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ NH ₂
266C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ NH ₂
267C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ NH ₂
268C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ NH ₂
269C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ NH ₂

270C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ NH ₂
271C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ NMe ₂
272C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ NMe ₂
273C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ NMe ₂
274C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ S(O) ₂ NMe ₂
275C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ S(O) ₂ NMe ₂
276C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ S(O) ₂ NMe ₂
277C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)CH ₂ S(O) ₂ Me
278C	1-hydroxycyclopentyl	-C≡C-	-C(O)CH ₂ S(O) ₂ Me
279C	1-hydroxycyclopentyl	-C=C-	-C(O)CH ₂ S(O) ₂ Me
280C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)CH ₂ S(O) ₂ Me
281C	1-hydroxycyclohexyl	-C≡C-	-C(O)CH ₂ S(O) ₂ Me
282C	1-hydroxycyclohexyl	-C=C-	-C(O)CH ₂ S(O) ₂ Me
283C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-C(O)CH ₂ CH ₂ S(O) ₂ Me
284C	1-hydroxycyclopentyl	-C≡C-	-C(O)CH ₂ CH ₂ S(O) ₂ Me
285C	1-hydroxycyclopentyl	-C=C-	-C(O)CH ₂ CH ₂ S(O) ₂ Me
286C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-C(O)CH ₂ CH ₂ S(O) ₂ Me
287C	1-hydroxycyclohexyl	-C≡C-	-C(O)CH ₂ CH ₂ S(O) ₂ Me
288C	1-hydroxycyclohexyl	-C=C-	-C(O)CH ₂ CH ₂ S(O) ₂ Me
289C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
290C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
291C	1-hydroxycyclopentyl	-C=C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
292C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
293C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
294C	1-hydroxycyclohexyl	-C=C-	-CH ₂ CH ₂ CH ₂ S(O) ₂ NH ₂
295C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-S(O) ₂ Me
296C	1-hydroxycyclopentyl	-C≡C-	-S(O) ₂ Me
297C	1-hydroxycyclopentyl	-C=C-	-S(O) ₂ Me
298C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-S(O) ₂ Me
299C	1-hydroxycyclohexyl	-C≡C-	-S(O) ₂ Me
300C	1-hydroxycyclohexyl	-C=C-	-S(O) ₂ Me

301C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-S(O) ₂ Et
302C	1-hydroxycyclopentyl	-C≡C-	-S(O) ₂ Et
303C	1-hydroxycyclopentyl	-C=C-	-S(O) ₂ Et
304C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-S(O) ₂ Et
305C	1-hydroxycyclohexyl	-C≡C-	-S(O) ₂ Et
306C	1-hydroxycyclohexyl	-C=C-	-S(O) ₂ Et
307C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-S(O) ₂ iPr
308C	1-hydroxycyclopentyl	-C≡C-	-S(O) ₂ iPr
309C	1-hydroxycyclopentyl	-C=C-	-S(O) ₂ iPr
310C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-S(O) ₂ iPr
311C	1-hydroxycyclohexyl	-C≡C-	-S(O) ₂ iPr
312C	1-hydroxycyclohexyl	-C=C-	-S(O) ₂ iPr
313C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-S(O) ₂ tBu
314C	1-hydroxycyclopentyl	-C≡C-	-S(O) ₂ tBu
315C	1-hydroxycyclopentyl	-C=C-	-S(O) ₂ tBu
316C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-S(O) ₂ tBu
317C	1-hydroxycyclohexyl	-C≡C-	-S(O) ₂ tBu
318C	1-hydroxycyclohexyl	-C=C-	-S(O) ₂ tBu
319C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-S(O) ₂ NH ₂
320C	1-hydroxycyclopentyl	-C≡C-	-S(O) ₂ NH ₂
321C	1-hydroxycyclopentyl	-C=C-	-S(O) ₂ NH ₂
322C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-S(O) ₂ NH ₂
323C	1-hydroxycyclohexyl	-C≡C-	-S(O) ₂ NH ₂
324C	1-hydroxycyclohexyl	-C=C-	-S(O) ₂ NH ₂
325C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-S(O) ₂ NMe ₂
326C	1-hydroxycyclopentyl	-C≡C-	-S(O) ₂ NMe ₂
327C	1-hydroxycyclopentyl	-C=C-	-S(O) ₂ NMe ₂
328C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-S(O) ₂ NMe ₂
329C	1-hydroxycyclohexyl	-C≡C-	-S(O) ₂ NMe ₂
330C	1-hydroxycyclohexyl	-C=C-	-S(O) ₂ NMe ₂
331C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-S(O) ₂ CH ₂ S(O) ₂ Me

332C	1-hydroxycyclopentyl	-C≡C-	-S(O)2CH2S(O)2Me
333C	1-hydroxycyclopentyl	-C=C-	-S(O)2CH2S(O)2Me
334C	1-hydroxycyclohexyl	-(CH2)2-	-S(O)2CH2S(O)2Me
335C	1-hydroxycyclohexyl	-C≡C-	-S(O)2CH2S(O)2Me
336C	1-hydroxycyclohexyl	-C=C-	-S(O)2CH2S(O)2Me
337C	1-hydroxycyclopentyl	-(CH2)2-	-S(O)2CH2S(O)2Et
338C	1-hydroxycyclopentyl	-C≡C-	-S(O)2CH2S(O)2Et
339C	1-hydroxycyclopentyl	-C=C-	-S(O)2CH2S(O)2Et
340C	1-hydroxycyclohexyl	-(CH2)2-	-S(O)2CH2S(O)2Et
341C	1-hydroxycyclohexyl	-C≡C-	-S(O)2CH2S(O)2Et
342C	1-hydroxycyclohexyl	-C=C-	-S(O)2CH2S(O)2Et
343C	1-hydroxycyclopentyl	-(CH2)2-	-S(O)2CH2S(O)2iPr
344C	1-hydroxycyclopentyl	-C≡C-	-S(O)2CH2S(O)2iPr
345C	1-hydroxycyclopentyl	-C=C-	-S(O)2CH2S(O)2iPr
346C	1-hydroxycyclohexyl	-(CH2)2-	-S(O)2CH2S(O)2iPr
347C	1-hydroxycyclohexyl	-C≡C-	-S(O)2CH2S(O)2iPr
348C	1-hydroxycyclohexyl	-C=C-	-S(O)2CH2S(O)2iPr
349C	1-hydroxycyclopentyl	-(CH2)2-	-S(O)2CH2S(O)2tBu
350C	1-hydroxycyclopentyl	-C≡C-	-S(O)2CH2S(O)2tBu
351C	1-hydroxycyclopentyl	-C=C-	-S(O)2CH2S(O)2tBu
352C	1-hydroxycyclohexyl	-(CH2)2-	-S(O)2CH2S(O)2tBu
353C	1-hydroxycyclohexyl	-C≡C-	-S(O)2CH2S(O)2tBu
354C	1-hydroxycyclohexyl	-C=C-	-S(O)2CH2S(O)2tBu
355C	1-hydroxycyclopentyl	-(CH2)2-	-C(O)NHCH2CO2H
356C	1-hydroxycyclopentyl	-C≡C-	-C(O)NHCH2CO2H
357C	1-hydroxycyclopentyl	-C=C-	-C(O)NHCH2CO2H
358C	1-hydroxycyclohexyl	-(CH2)2-	-C(O)NHCH2CO2H
359C	1-hydroxycyclohexyl	-C≡C-	-C(O)NHCH2CO2H
360C	1-hydroxycyclohexyl	-C=C-	-C(O)NHCH2CO2H
361C	1-hydroxycyclopentyl	-(CH2)2-	-SO2NHCH2CO2H
362C	1-hydroxycyclopentyl	-C≡C-	-SO2NHCH2CO2H

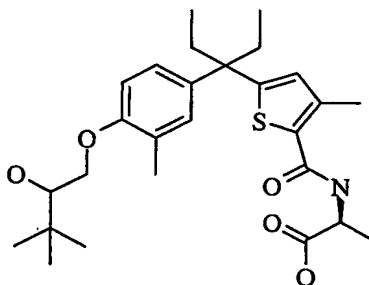
-139-

363C	1-hydroxycyclopentyl	-C=C-	-SO ₂ NHCH ₂ CO ₂ H
364C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-SO ₂ NHCH ₂ CO ₂ H
365C	1-hydroxycyclohexyl	-C≡C-	-SO ₂ NHCH ₂ CO ₂ H
366C	1-hydroxycyclohexyl	-C=C-	-SO ₂ NHCH ₂ CO ₂ H
367C	1-hydroxycyclopentyl	-(CH ₂) ₂ -	-CH ₂ -S-Me
368C	1-hydroxycyclopentyl	-C≡C-	-CH ₂ -S-Me
369C	1-hydroxycyclopentyl	-C=C-	-CH ₂ -S-Me
370C	1-hydroxycyclohexyl	-(CH ₂) ₂ -	-CH ₂ -S-Me
371C	1-hydroxycyclohexyl	-C≡C-	-CH ₂ -S-Me
372C	1-hydroxycyclohexyl	-C=C-	-CH ₂ -S-Me

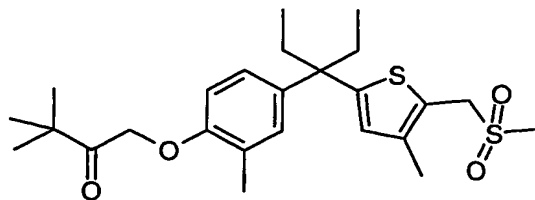
Particularly preferred chemical species used in the method of the invention are represented by structural formulae P101 to P106 and P200 to P206 a pharmaceutically acceptable salt solvate or prodrug derivative thereof:

5

P100

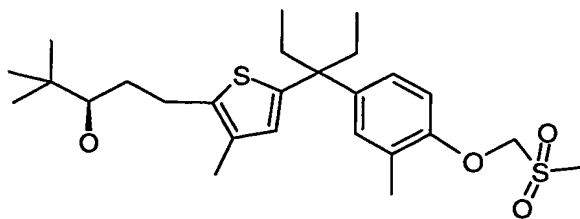


10 P101

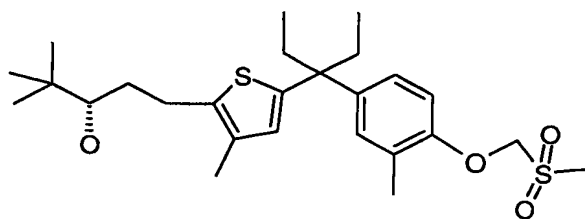


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P102

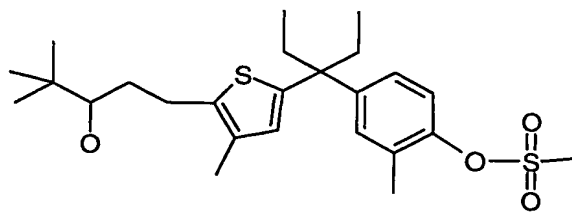


5 P103

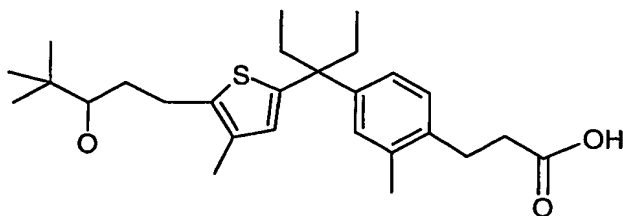


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P104



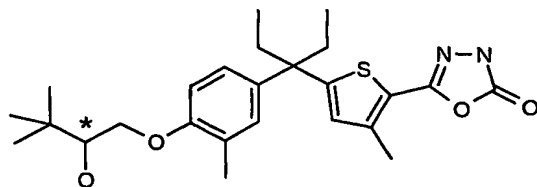
P105



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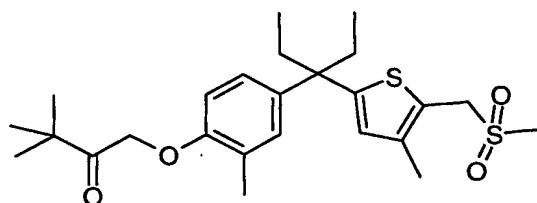
P106



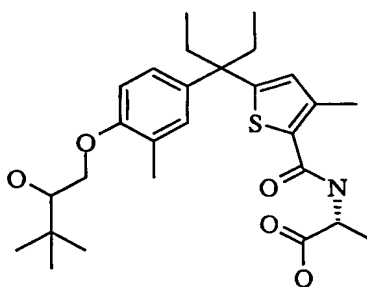
Other preferred compounds for the treatment of vesicant damage are those defined

5 by structural formulae P101 and P200 to P206, as follows:

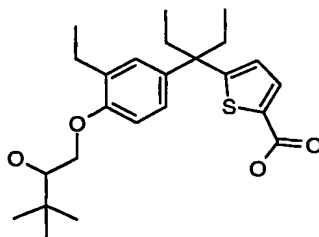
P101



P200

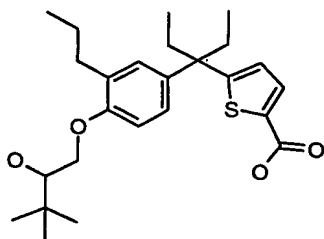


10 P201

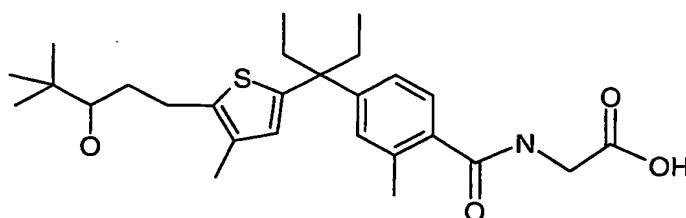


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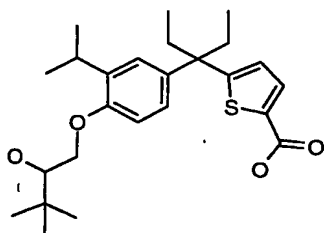
P202



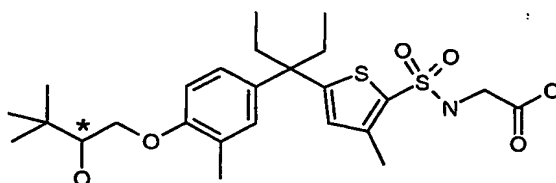
P203



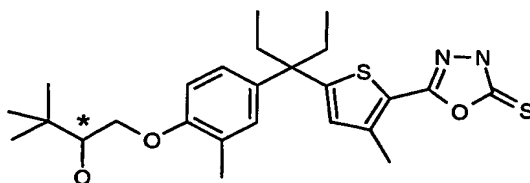
5 P204



P205



P206



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The salts of the Active Ingredients are an additional aspect of the invention. The skilled artisan will also appreciate that the family of compounds include acidic and basic members and that the present invention includes pharmaceutically acceptable salts

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thereof.

In those instances where the compounds of the invention possess acidic or basic functional groups various salts may be formed which are more water soluble and physiologically suitable than the parent compound. Representative pharmaceutically acceptable salts, include but are not limited to, the alkali and alkaline earth salts such as lithium, sodium, potassium, ammonium, calcium, magnesium, aluminum, zinc, and the like. Sodium and potassium salts are particularly preferred. Salts are conveniently prepared from the free acid by treating the acid in solution with a base or by exposing the acid to an ion exchange resin. For example, a carboxylic acid substituent on the compound of Formula I may be selected as $-CO_2H$ and salts may be formed by reaction with appropriate bases (e.g., NaOH, KOH) to yield the corresponding sodium and potassium salt.

Included within the definition of pharmaceutically acceptable salts are the relatively non-toxic, inorganic and organic base addition salts of compounds of the present invention, for example, ammonium, quaternary ammonium, and amine cations, derived from nitrogenous bases of sufficient basicity to form salts with the compounds of this invention (see, for example, S. M. Berge, *et al.*, "Pharmaceutical Salts," J. Phar. Sci., 66: 1-19 (1977)). Moreover, the basic group(s) of the compound of the invention may be reacted with suitable organic or inorganic acids to form salts such as acetate, benzenesulfonate, benzoate, bicarbonate, bisulfate, bitartrate, borate, bromide, camsylate, carbonate, chloride, choline, clavulanate, citrate, chloride, chloroprocaine, choline, diethanolamine, dihydrochloride, diphosphate, edetate, edisylate, estolate, esylate, ethylenediamine, fluoride, fumarate, gluceptate, gluconate, glutamate, glycolylarsanilate, hexylresorcinate, hydrabamine, bromide, chloride, hydrobromide, hydrochloride, hydroxynaphthoate, iodide, isothionate, lactate, lactobionate, laurate, malate, maleate, malseate, mandelate, meglumine, mesylate, mesviate, methylbromide, methylnitrate, methylsulfate, mucate, napsylate, nitrate, oleate, oxalate, palmitate, pamoate, pantothenate, phosphate, polygalacturonate, procaine, salicylate, stearate, subacetate, succinate, sulfate, tannate, tartrate, teoclate, tosylate, trifluoroacetate, trifluoromethane sulfonate, and valerate.

Certain compounds used in the method of the invention may possess one or more chiral centers and may thus exist in optically active forms. Likewise, when the

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compounds contain an alkenyl or alkenylene group there exists the possibility of cis- and trans- isomeric forms of the compounds. The R- and S- isomers and mixtures thereof, including racemic mixtures as well as mixtures of cis- and trans- isomers, and all tautomers are contemplated by this invention. Additional asymmetric carbon atoms can be present in a substituent group such as an alkyl group. All such isomers as well as the mixtures thereof are intended to be included in the invention. If a particular stereoisomer is desired, it can be prepared by methods well known in the art by using stereospecific reactions with starting materials which contain the asymmetric centers and are already resolved or, alternatively by methods which lead to mixtures of the stereoisomers and subsequent resolution by known methods. For example, a chiral column may be used such as those sold by Daicel Chemical Industries identified by the trademarks: CHIRALPAK AD, CHIRALPAK AS, CHIRALPAK OD, CHIRALPAK OJ, CHIRALPAK OA, CHIRALPAK OB, CHIRALPAK OC, CHIRALPAK OF, CHIRALPAK OG, CHIRALPAK OK, and CHIRALPAK CA-1.

By another conventional method, a racemic mixture may be reacted with a single enantiomer of some other compound. This changes the racemic form into a mixture of diastereomers. These diastereomers, because they have different melting points, different boiling points, and different solubilities can be separated by conventional means, such as crystallization.

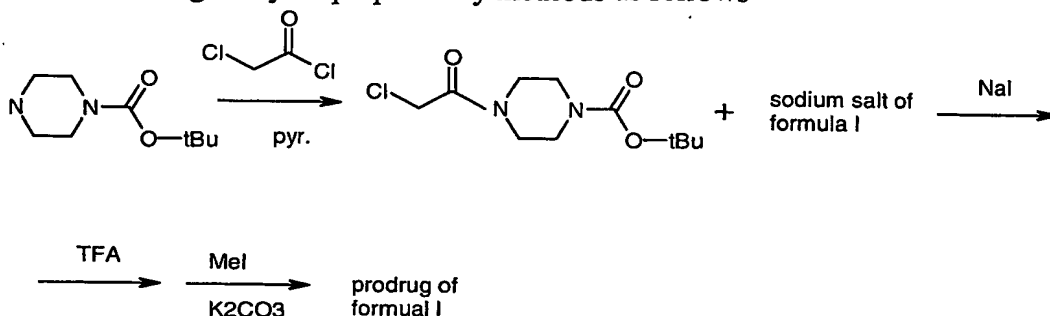
The method of the present invention is also embodied in mixtures of Active Ingredients.

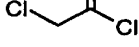
Prodrugs are derivatives of the compounds used in the method of the invention which have chemically or metabolically cleavable groups and become by solvolysis or under physiological conditions the compounds of the invention which are pharmaceutically active in vivo. Derivatives of the compounds of this invention have activity in both their acid and base derivative forms, but the acid derivative form often offers advantages of solubility, tissue compatibility, or delayed release in a mammalian organism (see, Bundgard, H., Design of Prodrugs, pp. 7-9, 21-24, Elsevier, Amsterdam 1985). Prodrugs include acid derivatives well known to practitioners of the art, such as, for example, esters prepared by reaction of the parent acidic compound with a suitable alcohol, or amides prepared by reaction of the parent acid compound with a suitable

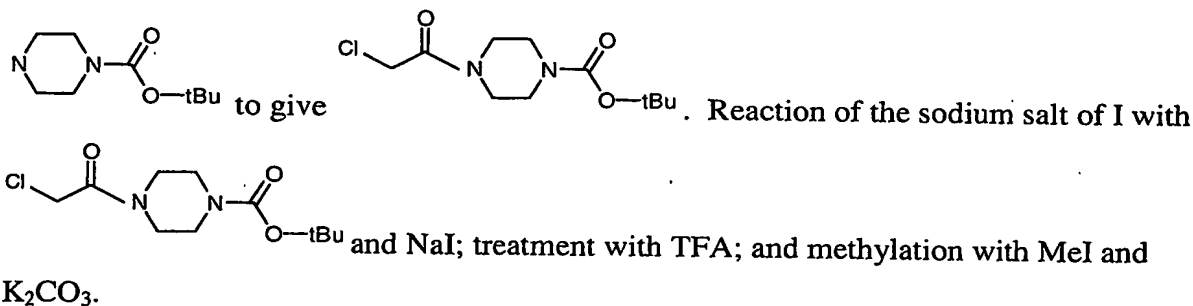
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amine. Simple aliphatic or aromatic esters derived from acidic groups pendent on the compounds of this invention are preferred prodrugs. In some cases it is desirable to prepare double ester type prodrugs such as (acyloxy) alkyl esters or ((alkoxycarbonyl)oxy)alkyl esters. Particularly preferred esters as prodrugs are methyl, ethyl, propyl, isopropyl, n-butyl, isobutyl, tert-butyl, morpholinoethyl, and N,N-diethylglycolamido.

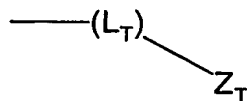
Prodrugs may be prepared by methods as follows



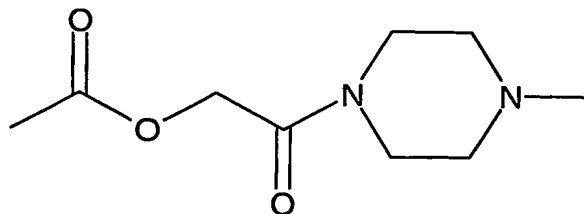
Prodrug of formula I is prepared by the following: treatment of  with



for example, to provide a combined group



15 in Formula I typified by;



Pharmaceutical Formulations containing the Novel Compounds used in the Method of the Invention:

Pharmaceutical formulations used in the method of the invention are prepared by combining a therapeutically effective amount of Active Ingredient together with a pharmaceutically acceptable carrier or diluent. The present pharmaceutical formulations are prepared by known procedures using well-known and readily available ingredients.

In making the compositions of the present invention, the Active Ingredient will usually be admixed with a carrier, or diluted by a carrier, or enclosed within a carrier which may be in the form of a capsule, sachet, paper or other container. When the carrier serves as a diluent, it may be a solid, semi-solid or liquid material which acts as a vehicle, or can be in the form of tablets, pills, powders, lozenges, elixirs, suspensions, emulsions, solutions, syrups, aerosols (as a solid or in a liquid medium), or ointment, containing, for example, up to 10% by weight of the compound. The Active Ingredient is preferably formulated prior to administration.

The Active Ingredient may also be delivered by suitable formulations contained in a transderm patch. Alternatively, the Active Ingredient may be delivered to a patient by sublingual administration.

For the pharmaceutical formulations any suitable carrier known in the art can be used. In such a formulation, the carrier may be a solid, liquid, or mixture of a solid and a liquid. Solid form formulations include powders, tablets and capsules. A solid carrier can be one or more substances which may also act as flavoring agents, lubricants, solubilisers, suspending agents, binders, tablet disintegrating agents and encapsulating material.

Tablets for oral administration may contain suitable excipients such as calcium carbonate, sodium carbonate, lactose, calcium phosphate, together with disintegrating agents, such as maize, starch, or alginic acid, and/or binding agents, for example, gelatin or acacia, and lubricating agents such as magnesium stearate, stearic acid, or talc.

In powders the carrier is a finely divided solid which is in admixture with finely divided Active ingredient. In tablets the Active Ingredient is mixed with a carrier having the necessary binding properties in suitable proportions and compacted in the shape and

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size desired. The powders and tablets preferably contain from about 1 to about 99 weight percent of Active Ingredient. Suitable solid carriers are magnesium carbonate, magnesium stearate, talc, sugar lactose, pectin, dextrin, starch, gelatin, tragacanth, methyl cellulose, sodium carboxymethyl cellulose, low melting waxes, and cocoa butter.

5 Sterile liquid form formulations include suspensions, emulsions, syrups and elixirs.

The Active Ingredient may be dissolved or suspended in a pharmaceutically acceptable carrier, such as sterile water, sterile organic solvent or a mixture of both. The Active Ingredient may often be dissolved in a suitable organic solvent, for instance
10 aqueous propylene glycol. Other compositions can be made by dispersing the finely divided Active Ingredient in aqueous starch or sodium carboxymethyl cellulose solution or in a suitable oil.

Ointment Formulation for Prevention or Treatment Vesicant Damage:

Treatment of visicant damage may be accomplished with topical application, by
15 a formulation in the form of a cream, oil, emulsion, paste or ointment containing a therapeutically effective amount of Active Ingredient. The formulation for topical treatment contains from 0.5 to 0.00005 weight percent, preferably from .05 to 0.0005 weight percent, and most preferably from 0.025 to 0.001 of Active Ingredient.

For example, two semisolid topical preparations useful as vehicles for VDR
20 modulators in treatment and prevention of psoriasis are as follows:

Polyethylene Glycol Ointment USP (p. 2495)

Prepare Polyethylene Glycol Ointment as follows:

Polyethylene Glycol 3350	400 g.
Polyethylene Glycol 400	<u>600 g.</u>
To make	1000 g.

25

Heat the two ingredients on a water bath to 65C. Allow to cool, and stir until congealed. If a firmer preparation is desired, replace up to 100 g of the polyethylene glycol 400 with an equal amount of polyethylene glycol 3350.

Hydrophilic Ointment USP (p. 1216)

30

Prepare Hydrophilic Ointment as follows:

Methylparaben	0.25 g.
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Propylparaben	0.15 g.
Sodium Lauryl Sulfate	10 g.
Propylene Glycol	120 g.
Stearyl Alcohol	250 g.
White Petrolatum	250 g.
Purified Water	<u>370 g.</u>
To make about	1000 g.

The Stearyl Alcohol and White Petrolatum are melted on a steam bath, and warmed to about 75C. The other ingredients, previously dissolved in the water are added, warmed to 75C, and the mixture stirred until it congeals.

For each of the above formulations Active Ingredient is added during the heating step in an amount that is from 0.5 to 0.00005 weight percent, preferably from .05 to 0.0005 weight percent, and most preferably from 0.025 to 0.001 weight percent of the total ointment weight. (Source: - United States Pharmacopoeia 24, United States Pharmacopeial Convention, 1999)

Methods of Using the Compounds of the Invention:

Particularly preferred is the treatment of vesicant damage to tissue by administration to a mammal (including a human) of a therapeutically effective amount of compounds of Formulae I and II. By "pharmaceutically effective amount" it is meant that quantity of pharmaceutical agent corresponding to formulae I or II which prevents, removes or reduces the deleterious effects of vesicants.

The specific dose of a compound administered according to this invention to obtain therapeutic or prophylactic effects will, of course, be determined by the particular circumstances surrounding the case, including, for example, the compound administered, the route of administration and the condition being treated. Typical daily doses will contain a pharmaceutically effective amount typically in the range of from about 0.0001 mg/kg/day to about 50 mg/kg/day of body weight of the active compound used in the method of this invention. Preferably the dose of compounds of the invention will be from 0.0001 to 5 mg/kg/day of body weight.

Preferably compounds used in the method of the invention (e.g., per Formula I thru VII) or pharmaceutical formulations containing these compounds are in unit

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dosage form for administration to a mammal. The unit dosage form can be a capsule or tablet itself, or the appropriate number of any of these. The quantity of Active ingredient in a unit dose of composition may be varied or adjusted from about 0.0001 to about 1000 milligrams or more according to the particular treatment involved. It may be appreciated that it is necessary to make routine variations to the dosage depending on the age and condition of the patient

Therapy for vesicants may, in addition to Active Ingredient, optionally include topical steroids; for example, betamethasone dipropionate, betamethasone valerate, clobetasol propionate, desonide, desoximetasone, dexamethasone, dexamethasone sodium phosphate, diflorasone diacetate, fluocinonide, flurandrenolide, fluticasone propionate, halcinonide, hydrocortisone, hydrocortisone acetate, hydrocortisone butyrate, hydrocortisone valerate, mometasone furoate, and triamcinolone acetonide.

A combination of (i) Active Ingredient, and (ii) a topical steroid may be used for treatment or prevention of vesicant damage.

The specific dose of Active Ingredient administered according to this invention to obtain therapeutic or prophylactic effects will, of course, be determined by the particular circumstances surrounding the case, including, for example, the compound administered, the route of administration and the condition being treated. Typical daily doses will contain a pharmaceutically effective amount typically in the range of from about 0.0001 mg/kg/day to about 50 mg/kg/day of body weight of an active compound of this invention. Preferably the dose of compounds of the invention will be from 0.0001 to 5 mg/kg/day of body weight.

Preferably the Active Ingredient or pharmaceutical formulations containing Active Ingredient are in unit dosage form for administration to a mammal. The unit dosage form can be a capsule or tablet itself, or the appropriate number of any of these. The quantity of Active Ingredient in a unit dose of composition may be varied or adjusted from about 0.0001 to about 1000 milligrams or more according to the particular treatment involved. It may be appreciated that it is necessary to make routine variations to the dosage depending on the age and condition of the patient. The compounds of the invention may be administered by a variety of routes including oral,

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aerosol, rectal, transdermal, sublingual, subcutaneous, intravenous, intramuscular, and intranasal. The dosage will also depend on the route of administration.

Examples

5 General Experimental Conditions used for Preparation of Compounds used in the Method of the Invention:

The starting material/intermediate is the compound from the immediate preceding experimental unless otherwise indicated.

10 All reactions are performed under nitrogen/argon atmosphere, in a stirred reaction vessel, and at room temperature unless indicated otherwise.

Unless otherwise indicated, the organic layer is MgSO₄/Na₂SO₄ dried is defined as stirring the solution with a dessicant for 5-15 m and filtering off the dessicant to give an anhydrous filtrate.

15 For analogous multi-step reaction procedures, the yield is given either for the ultimate step or overall multi-steps as indicated.

Solutions are "concentrated" at a range of 25-75 °C with reduced pressure.
in-vacuo – 25-75 °C; 0.05 to 1 mm

20 Unless otherwise indicated, "the residue is chromatographed" is defined as silica gel chromatography of residue with moderate nitrogen pressure (flash chromatography) or a medium pressure chromatography systems using a silica gel to crude product ratio of ~10-100.

Thin layer chromatography is performed with silica gel plates with UV and/or appropriate staining solution.

NMR spectra are obtained with either 300 or 400 mHz spectrometer.

25 NMR – denotes NMR spectrum is consistent with assigned structure.

HRMS – high resolution mass spectrum

ES-MS – electrospray mass spectrum

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Abbreviations:

Aq - aqueous

d – day

eq - equivalent

5 h – hour

m – minute

satd – saturated

disp – dispersion

quant – quantitative

10 rt for retention time (both small caps to minimize confusion with RT)

RT – room temperature

Chemical Definitions:

15 BBr₃ – boron tribromideBF₃-OEt₂ – boron trifluoride etherate

BnBr – benzyl bromide

CH₂Cl₂-dichloromethaneCH₃CN – acetonitrile

20 CO-carbon monoxide

Dess-Martin reagent – 1,1,1-tris(acetyloxy)-1,1-dihydro-1,2-benziodoxol-3-(1H)-one

DIBALH - Diisobutyl Aluminum Hydride

DMAP - 4-(dimethylamino)pyridine

25 DMF – N,N-dimethylformamide

DMSO – dimethylsulfoxide

DPPB – 1,4-bis(diphenylphosphino)butane

DPPF – dichloro[1,1'-bis(diphenylphosphino)ferrocene

EDCI – 3-Ethyl-1-[3-(dimethylamino)propyl]carbodiimide hydrochloride

30 Et₃N – triethylamine

EtMgBr- ethyl magnesium bromide

EtOAc – ethyl acetate

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	EtOH – ethanol
	H ₂ NCH ₂ CO ₂ Me – methyl glycinate
	Hept – heptane
	Hex - hexanes
5	HN(OMe)Me – N-methyl-O-methyl hydroxylamine
	HNMe ₂ – dimethyl amine
	HATU – O-(7-azabenzotriazol-1-yl)-N,N,N',N'-tetramethyluronium hexafluorophosphate
	HOAT – 7-aza-1-hydroxybenzotriazole
10	HOBt – 1-hydroxybenzotriazole
	K ₂ CO ₃ – potassium carbonate
	KOH – potassium hydroxide
	LAH – lithium aluminum hydride
	LiHMDS – lithium hexamethyldisilazide
15	mCPBA – meta-chloroperbenzoic acid
	MeI – methyl iodide
	MeOH – methanol
	NaBH ₄ – sodium borohydride
	MgSO ₄ – magnesium sulfate
20	NaH – sodium hydride
	NaHCO ₃ – sodium bicarbonate
	NaI – sodium iodide
	Na ₂ SO ₄ – sodium sulfate
	NH ₄ Cl – ammonium chloride
25	NMO – 4-methylmorpholine N-oxide
	NMP – N-methylpyrrolidin-2-one
	Na-S-R ₃ – sodium alkylmercaptide
	PBr ₃ – phosphorus tribromide
	Pd(DPPF) – palladium dichloro[1,1'-bis(diphenylphosphino)ferrocene]
30	Pd(OAc) ₂ – palladium (II) acetate
	Pd(PPP) ₄ – palladium tetrakis(triphenylphosphine)
	Pd-C – palladium on carbon

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(PhO)₂P(O)N₃ – diphenyl phosphorus azide

pTSA – para-toluenesulfonic acid

Pyr – pyridine

Red-Al – sodium bis(2-methoxyethoxy)aluminum hydride

5 R₂MgBr – alkyl magnesium bromideR₃MgBr – alkyl magnesium bromideR₅MgBr – alkyl magnesium bromideR₂S(O)₂NH₂ – alkylsulfonamide

TBAF- tetrabutylammonium fluoride

10 TBSCl- *tert*-butyldimethylsilyl chloridetBuC(O)CH₂Br – 1-bromopinacoloneTf₂O – triflic anhydride

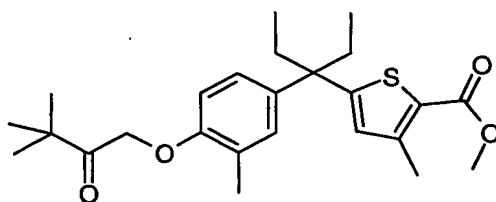
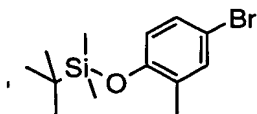
TFA – trifluoroacetic acid

THF – tetrahydrofuran

15 TPAP – tetrapropylammonium perruthenate

Zn(OTf)₂ – zinc trifluoromethane sulfonate.Example 1

Preparation of 3'-[4-(2-Oxo-3,3-dimethylbutoxy-3-methylphenyl)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.

A. 2-(*t*-Butyldimethylsilyloxy)-5-bromotoluene.

To a 0 °C mixture of 2-hydroxy-5-bromotoluene(48.63 g, 260 mmol), DMF
 25 (260 ml), imidazole (18.58 g, 273 mmol) is added *t*-butyldimethylsilyl chloride (41.15 g, 273 mol) in portions. After stirring for 30 m, the reaction is warmed to RT and stirred for 16 h. The reaction mixture is poured into ice/water (1.25 l) and extracted

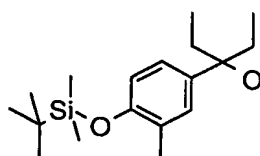
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with Et₂O. The organic layer is washed with water (2X100 ml), 1N NaOH (2X5 ml), water, brine, MgSO₄ dried, concentrated, chromatographed (hex), and azeotroped with toluene to give the title compound as an oil (75.7 g, 97%)

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.21 (s, 6H), 0.99 (s, 9H), 2.15 (s, 3H), 6.77 (d, J = 8.3 Hz, 1H), 7.25 (dd, J = 6.8, 8.3 Hz, 1H), 7.37 (s, 1H).

EI-MS: 300, 302

B. 3'-[4-(t-Butyldimethylsilyloxy)-3-methylphenyl]pentan-3-ol.



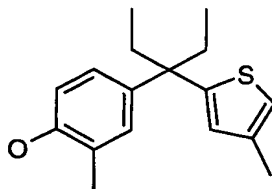
Magnesium turnings (6 g, 248 mmol) is vigorously stirred under nitrogen for 18 h. To the magnesium turnings is added THF (600 ml) and I₂ (100 mg, 0.39 mmol). This is followed by dropwise addition of 2-(t-butyldimethylsilyloxy)-5-bromotoluene (60 g, 200 mmol) in THF (500 ml) and at the same time the reaction is gradually heated by setting the oil bath to 70 °C. After half of the addition of the 2-(t-butyldimethylsilyloxy)-5-bromotoluene/THF is complete, the mixture is heated to 90 °C for 2.5 h. The mixture is allowed to cool to RT and then cooled to 0 °C. To this mixture is added 3-pentanone (21.2 ml, 200 mmol), warmed to RT, and then heated to 50 °C for 3 h. After cooling, the reaction is diluted with Et₂O and water, and quenched with 1N HCl to pH 7. The mixture is partitioned and the organic layer is washed with water, Na₂SO₄ dried, concentrated, chromatographed (1.25 kg silica gel, 40% CH₂Cl₂/Hex to 70% CH₂Cl₂/Hex; rf: 0.3) to give the title compound as an oil (44.3 g, 72%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.20 (s, 6H), 0.64 (t, J = 7.8 Hz, 6H), 1.00 (s, 9H), 1.67 (m, 4H), 2.15 (s, 3H), 4.38 (s, 1H), 6.70 (d, J = 8.8 Hz, 1H), 7.04 (dd, J = 8.3, 2.0 Hz, 1H), 7.14 (d, J = 2.0 Hz, 1H).

EI-MS: 308.37

C. 3'-[4-(Hydroxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane.

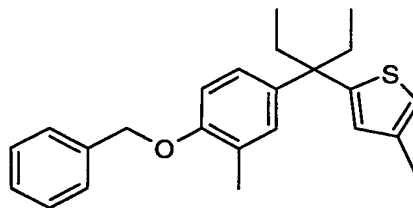
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To a -78 °C mixture of 3'-[4-(t-butylthiophen-2-yl)]pentan-3-ol (44 g, 142 mmol) and 3-methylthiophene (83 ml, 854 mmol) is added BF₃-Et₂O (180 ml, 1.42 mol). After stirring for 45 m, the reaction is placed in a 0 °C bath, allowed to warm to RT and stirred for 6 h. The reaction is poured into Et₂O/water and washed with 5N HCl. The organic layer is washed with water, Na₂SO₄ dried, concentrated, and chromatographed (1.5 kg SiO₂, 70% CHCl₃/hex) to give the title compound (37 g, 95%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.63 (t, J = 7.3 Hz, 3H), 2.01 (m, 4H), 2.08 (s, 3H), 2.16 (s, 3H), 6.67 (m, 2H), 6.88 (m, 2H), 6.93 (d, J = 1.9 Hz, 1H), 9.10 (s, 1H). High Res. EI-MS: 274.1389; calc. for C₁₇H₂₂OS: 274.1391

D. 3'-[4-(Benzyloxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane.



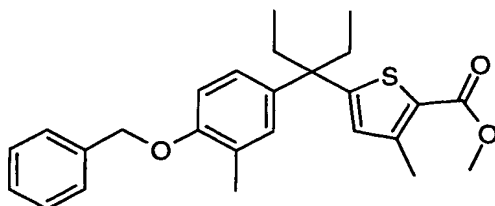
To a 0 °C mixture of 3'-[4-(hydroxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane (7.1 g, 25.9 mmol) and DMF (60 ml) is added 60% NaH disp (1.1 g, 28.5 mmol) and stirred for 15 m. The reaction is added benzyl bromide (3.4 ml, 28.5 mmol), warmed to RT and stirred overnight. The reaction is concentrated in-vacuo and partitioned between Et₂O/1N HCl. The organic layer is washed with water, dried with Na₂SO₄, concentrated, and chromatographed (20% CHCl₃/hex to 30% CHCl₃/hex) to give the title compound (8.7 g, 92%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.61 (t, J = 7.3 Hz, 6H), 1.95-2.07 (m, 4H), 2.13 (s, 6H), 5.05 (s, 2H), 6.65 (d, J = 1.5 Hz, 1H), 6.86 (m, 2H), 7.01 (m, 2H), 7.31 (d, J = 7.3 Hz, 1H), 7.38 (m, 2H), 7.44 (d, J = 6.8 Hz, 2H).

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High Res. EI-MS: 364.1878; calc. for $C_{24}H_{28}OS$: 364.1861

E. 3'-[4-(Benzyloxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.



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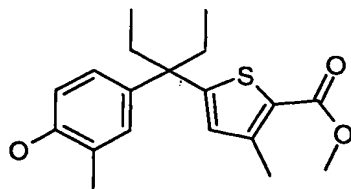
concentrated, and chromatographed (10% EtOAc/hex) to give the title To a $-78^{\circ}C$ mixture of 3'-[4-(benzyloxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane (7.7 g, 21 mmol) and THF (50 ml) is added 1.6 M n-BuLi/hex (1.6 ml, 25.3 mmol) and warmed to $0^{\circ}C$ for 2 m. The reaction is cooled to $-78^{\circ}C$, added methyl
 10 chloroformate (1.7 ml, 25 mmol) and warmed to RT over 2 h. The reaction is added Et₂O, quenched with 1N HCl, and partitioned. The organic layer is washed with brine, Na₂SO₄ dried, compound (4.8 g, 54%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 2.02-2.07 (m, 4H), 2.14 (s, 3H), 2.40 (s, 3H), 3.69 (s, 3H), 5.06 (s, 2H), 6.82 (s, 1H), 6.92 (d, J = 8.8 Hz, 1H),
 15 7.03 (m, 2H), 7.31 (d, J = 7.3 Hz, 1H), 7.38 (t, J = 7.3 Hz, 2H), 7.44 (t, J = 7.3 Hz, 2H).

High Res. ES-MS: 423.2011; calc. for $C_{26}H_{30}O_3S+H$: 423.1994

F. 3'-[4-(Hydroxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.

20



A mixture of 3'-[4-(benzyloxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (290 mg, 0.686 mmol), 10% Pd/C (1.6 g, 1.5 mmol), EtOH (3 ml), and EtOAc (3 ml) is hydrogenated overnight at atmospheric pressure.

25 The reaction is filtered through diatomaceous earth with EtOH/EtOAc wash,

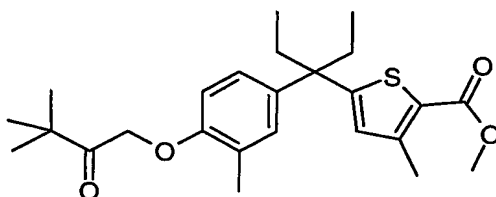
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concentrated, and chromatographed (CH₂Cl₂ to 10% EtOAc/CH₂Cl₂) to give the title compound (220 mg, quant).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.61 (t, J = 7.3 Hz, 6H), 1.98-2.07 (m, 4H), 2.05 (s, 3H), 2.39 (s, 3H), 3.69 (s, 3H), 6.66 (d, J = 8.3 Hz, 1H), 6.79 (s, 1H), 6.86 (dd, J = 8.3, 2.4 Hz, 1H), 6.91 (d, J = 2.0 Hz, 1H), 9.15 (s, 1H).

High Res. ES-MS: 333.1528; calc. for C₁₉H₂₄O₃S+H: 333.1524

G. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.



To a mixture of 3'-[4-(hydroxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (210 mg, 0.63 mmol) and DMF (2 ml) is added 60% NaH disp (25 mg, 0.63 mmol) and warmed to RT. The reaction is cooled to 0 °C, added 3,3-dimethyl-1-bromo-2-butanone (85 ul, 0.63 mmol), warmed to RT, and stirred overnight. The mixture is concentrated and partitioned between Et₂O/1N HCl. The organic layer is washed with water, dried with Na₂SO₄, and chromatographed (10% EtOAc/hex to 20% EtOAc/hex) to give the title compound (230 mg, 85%).

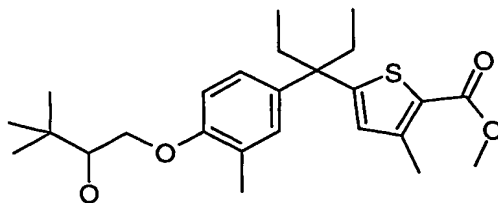
¹NMR (400MHz, DMSO-d₆) δ ppm: 0.61 (t, J = 7.3 Hz, 6H), 1.15 (s, 9H), 2.01-2.08 (m, 4H), 2.14 (s, 3H), 2.40 (s, 3H), 3.69 (s, 3H), 5.08 (s, 2H), 6.60 (d, J = 8.3 Hz, 1H), 6.82 (s, 1H), 6.97 (d, J = 8.8 Hz, 1H), 7.00 (s, 1H).

High Res. ES-MS: 453.2072; calc. for C₂₅H₃₄O₄S+Na: 453.2076

Example 2

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.

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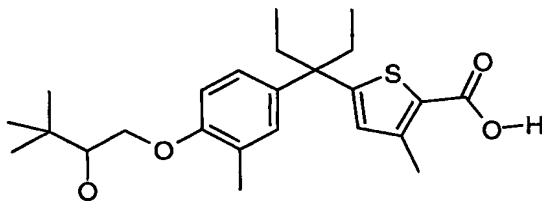
To a 0 °C mixture of 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (215 mg, 0.5 mmol) and MeOH (2 ml) is added NaBH₄ (28 mg, 0.75 mmol) and warmed to RT. The reaction is concentrated and partitioned between Et₂O/1N HCl. The organic layer is washed with water, dried with Na₂SO₄, and concentrated to give the title compound (220 mg, quant).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.90 (s, 9H), 1.99-2.08 (m, 4H), 2.11 (s, 3H), 2.40 (s, 3H), 3.44 (m, 1H), 3.69 (s, 3H), 3.75 (dd, J = 7.3, 10.2 Hz, 1H), 4.03 (dd, J = 3.4, 10.2 Hz, 1H), 4.79 (d, J = 5.4 Hz, 1H), 6.81 (s, 1H), 6.83 (d, J = 8.8 Hz, 1H), 6.98 (s, 1H), 7.01 (d, J = 8.8 Hz, 1H).

High Res. ES-MS: 450.2674; calc. for C₂₅H₃₆O₄S+NH₄: 450.2678

Example 3

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-carboxyl-4-methylthiophen-2-yl]pentane.



To a mixture of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (200 mg, 0.46 mmol), EtOH (1.5 ml), and water (0.5 ml) is added KOH (200 mg, 3.56 mmol). The reaction is heated to 70 °C for 4 h. The mixture is concentrated, partitioned between 1:1 Et₂O:EtOAc and 1N HCl. The organic layer is washed with 1N HCl, Na₂SO₄ dried, and concentrated to give the title compound (200 mg, quant).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.90 (s, 9H), 1.97-2.09 (m, 4H), 2.11 (s, 3H), 2.37 (s, 3H), 3.44 (m, 1H), 3.74 (dd, J = 7.3, 10.2 Hz, 1H), 4.01

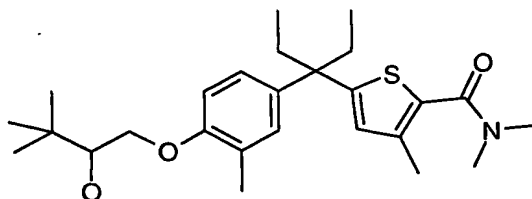
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(dd, $J = 3.4, 10.2$ Hz, 1H), 4.78 (d, $J = 5.4$ Hz, 1H), 6.76 (s, 1H), 6.82 (d, $J = 8.3$ Hz, 1H), 6.98 (s, 1H), 7.01 (d, $J = 8.8$ Hz, 1H), 12.58 (br s, 1H).

High Res. ES-MS: 436.2518; calc. for $C_{25}H_{36}O_4S + NH_4$: 436.2521

5 Example 4

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-(dimethylaminocarbonyl)-4-methylthiophen-2-yl]pentane.

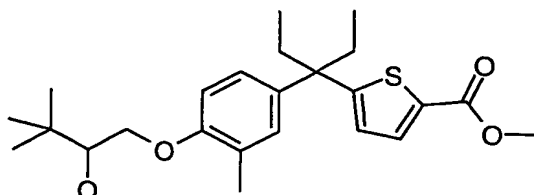


To a 0 °C mixture of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-
 10 3'-[5-carboxyl-4-methylthiophen-2-yl]pentane (175 mg, 0.42 mmol) and Et_3N (61 ul, 0.44 mmol) is added $(PhO)_2P(O)N_3$ (92 ul, 0.43 mmol). The reaction is warmed to RT and stirred for 30 m. After cooling to 0 °C, the reaction is added DMAP (56 mg, 0.46 mmol) and 2M $HNMe_2/THF$ (0.46 ml, 0.92 mmol). The mixture is warmed to RT and stirred for 2 h. The reaction is concentrated and partitioned between $Et_2O/1N$
 15 HCl. The organic layer is washed with 1N HCl, Na_2SO_4 dried, and chromatographed (CH_2Cl_2 to 15% $EtOAc/CH_2Cl_2$) to give the title compound (110 mg, 59%).
 1NMR (400MHz, $DMSO-d_6$) δ ppm: 0.62 (t, $J = 7.3$ Hz, 6H), 1.96-2.06 (m, 4H), 2.09 (s, 3H), 2.11 (s, 3H), 2.90 (s, 6H), 3.44 (m, 1H), 3.73 (dd, $J = 7.3, 10.2$ Hz, 1H), 4.01 (dd, $J = 3.4, 10.2$ Hz, 1H), 4.79 (br s, 1H), 6.65 (s, 1H), 6.82 (d, $J = 8.8$ Hz, 1H), 7.02
 20 (m, 2H).

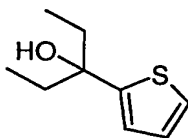
High Res. ES-MS: 446.2738; calc. for $C_{26}H_{39}NO_3S + H$: 446.2729

Example 5:

Preparation of 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl] pentane.



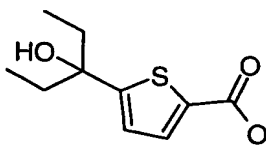
A. 2-(3-Hydroxy-3-pentyl)thiophene.



To a stirred 0 °C mixture of ethyl thiophene-2-carboxylate (3.12 g, 20.0 mmol) in diethyl ether (100 ml) is added 1M ethylmagnesium bromide (60 ml, 60 mmol). The reaction is allowed to warm to RT and stirred for 3 d. The reaction is partitioned between Et₂O and 1N NaHCO₃. The organic layer was Na₂SO₄ dried and concentrated to give the title compound (3.4 g, 99%).

H-NMR (ppm, CDCl₃): 7.98 (1H, d, 4.2 Hz), 6.95 (1H, m), 6.85 (1H, d, 3.0 Hz), 1.86 (4H, q, 7.5 Hz), 0.86 (6H, t, 7.5 Hz).

B. 5-(3-Hydroxy-3-pentyl)thiophene-2-carboxylic acid.

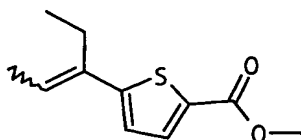


To a -78°C mixture of 2-(3-hydroxy-3-pentyl)thiophene (0.34 g, 2.0 mmol) in THF (2 ml) is added of 1.6 M n-butyllithium in Hex (2.75 ml, 4.4 mmol). The mixture is allowed to warm to RT and powdered dry ice (CO_2) is added. After one h, the mixture is partitioned between diethyl ether and 1N NaHCO_3 . The aqueous layer is washed with ether, acidified with conc. HCl and extracted with ether. The organic layer is Na_2SO_4 dried, filtered, and concentrated to give the title compound (0.236 g, 53%).

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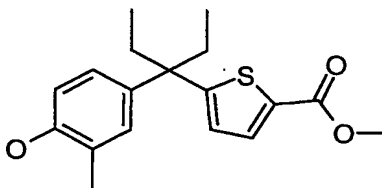
H-NMR (ppm, CDCl_3): 7.75 (1H, d, 3.0 Hz), 6.87 (1H, d, 3.0 Hz), 1.86 (4H, q, 5.7 Hz), 0.86 (6H, t, 5.7 Hz).

C. Methyl, 5-(E/Z-2-penten-3-yl)thiophene-2-carboxylate



To a mixture of 5-(3-hydroxy-3-pentyl)thiophene-2-carboxylic acid 0.236 g (1.05 mmol) and methanol (15 ml) is bubbled HCl gas for a few minutes. The mixture is heated at reflux for 2 h and then concentrated under vacuum. The residue is partitioned between Et_2O and 1N NaHCO_3 . The organic layer is Na_2SO_4 dried and concentrated to give the title compound (0.106 g, 62%).

D. 3'-[4-(Hydroxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.



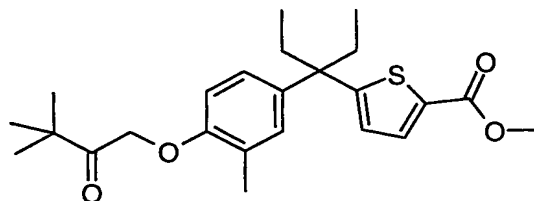
To a mixture of methyl 5-(E/Z-2-penten-3-yl)thiophene-2-carboxylate (0.106 g, 0.65 mmol) and o-cresol (0.282 g, 2.61 mmol) in a few drops of methylene chloride is added of BF_3 etherate (37 mg, 0.26 mmol). The mixture is stirred overnight and partitioned between Et_2O and 1N NaHCO_3 . The organic layer is Na_2SO_4 dried, concentrated, and excess o-cresol is distilled off (73 °C/0.10 mm). The residue is chromatographed (7.5% to 10% EtOAc /hex) to give the title compound (0.104 g, 50%).

H-NMR (ppm, CDCl_3): 7.62 (1H, d, 3.0 Hz), 6.96 (1H, s), 6.94 (1H, d, 6.0 Hz), 6.78 (1H, d, 3.0 Hz), 6.65 (1H, d, 6.0 Hz), 4.60 (1H, s), 3.82 (3H, s), 2.19 (3H, s), 2.10 (4H, q, 5.7 Hz), 0.69 (6H, t, 5.7 Hz).

LC/MS: 319.2 ($\text{M}+1$).

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E. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.

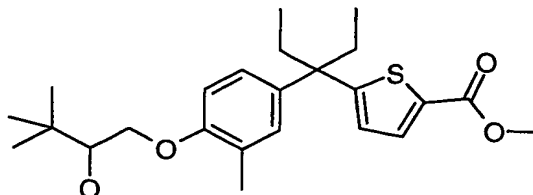


To a stirred 0 °C mixture of 60% disp NaH (15.7 mg, 0.39 mmol, hex washed) is added 3'-[4-(hydroxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (100 mg, 0.31 mmol) in DMF (2.0 ml). The resulting mixture is added 1-chloropinacolone (46 mg, 0.34 mmol) with a crystal of KI. The reaction is allowed to warm to RT and stirred overnight. The mixture is partitioned between Et₂O and 1N NaHCO₃. The organic layer is Na₂SO₄ dried, filtered, concentrated, and chromatographed (on 4g of silica gel with 5% EtOAc/hex) to give the title compound (0.114 g, 87%).

H-NMR (ppm, CDCl₃): 7.62 (1H, d, 3.0 Hz), 6.99 (1H, s), 6.97 (1H, d, 6.0 Hz), 6.77 (1H, d, 3.0 Hz), 6.50 (1H, d, 6.0 Hz), 4.83 (2H, s), 3.82 (3H, s), 2.24 (3H, s), 2.10 (4H, q, 5.7 Hz), 1.24 (9H, s), 0.68 (6H, t, 5.7 Hz).

LC/MS: 417.3 (M+1).

F. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.



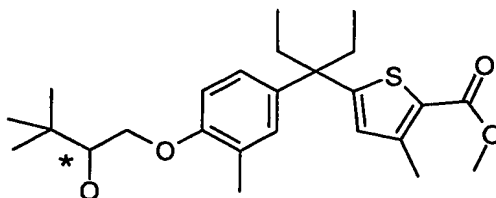
To a mixture of 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (28 mg, 0.067 mmol) and 95% EtOH (1 ml) is added NaBH₄ (3.8 mg, 0.1 mmol). After stirring overnight, the reaction is added acetone (several drops) and partitioned between CH₂Cl₂ and 1N NaHCO₃. The organic layer is washed with water, Na₂SO₄ dried, and concentrated to give the title compound (23 mg, 82%).

H-NMR (ppm, CDCl₃): 7.62 (1H, d, 2.7 Hz), 7.02 (1H, d, 6.0 Hz), 6.98 (1H, s), 6.78 (1H, d, 2.6 Hz), 6.71 (1H, d, 6.0 Hz), 4.06 (1H, d, 8.2 Hz), 3.86 (1H, d, 8.4 Hz), 3.82 (3H, s), 3.70 (1H, d, 8.2 Hz), 2.18 (3H, s), 2.10 (4H, q, 6.0 Hz), 1.00 (9H, s), 0.69 (6H, t, 5.8 Hz).

LC/MS: 418.2 (M⁺).

Example 6A and Example 6B:

Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.



A mixture of racemic 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (1.4 g, 3.25 mmol) is chromatographed with a ChiralPak AD column to give enantiomer 1, Example 6A (666 mg, 48%) and enantiomer 2, Example 6B (686 mg, 49%).

Enantiomer 1, Example 6A

HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/min (flow rate);

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rt = 5.8 m

 ^1NMR (300MHz, DMSO- d_6) equivalent to Example 2.High Res. ES-MS: 455.2231; calc. for $\text{C}_{25}\text{H}_{36}\text{O}_4\text{S}+\text{Na}$: 455.2232

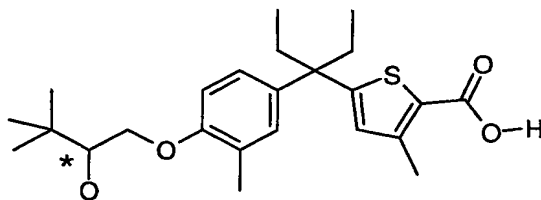
Enantiomer 2, Example 6B

- 5 HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate); rt = 9.8 m

 ^1NMR (300MHz, DMSO- d_6) equivalent to Example 2.High Res. ES-MS: 433.2427; calc. for $\text{C}_{25}\text{H}_{36}\text{O}_4\text{S}+\text{H}$: 433.2413

10 Example 7:

Preparation of enantiomer 1 of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy) -3-methylphenyl]-3'-[5-carboxy-4-methylthiophen-2-yl]pentane.

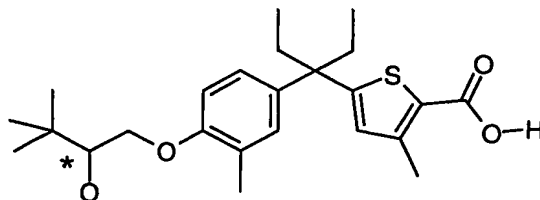


- 15 Using a procedure analogous to Example 3, enantiomer 1 of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (Example 6A) gives the title compound as a white foamy solid (440 mg, quant.).

 ^1NMR (300MHz, DMSO- d_6) equivalent to Example 3.High Res. ES-MS: 441.2073; calc. for $\text{C}_{24}\text{H}_{34}\text{O}_4\text{S}+\text{Na}$: 441.2076

20 Example 8:

Preparation of enantiomer 2 of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy) -3-methylphenyl]-3'-[5-carboxy-4-methylthiophen-2-yl]pentane.



- 25 Using a procedure analogous to Example 3, enantiomer 2 (Example 6B) of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy) -3-methylphenyl]-3'-[5-methoxycarbonyl-4-

-165-

methylthiophen-2-yl]pentane gives the title compound as a white foamy solid (440 mg, quant.).

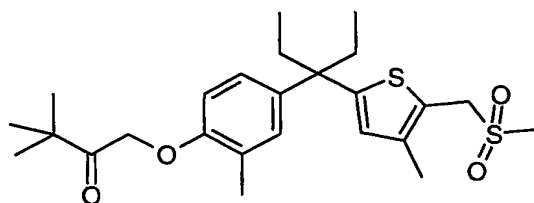
^1NMR (300MHz, DMSO- d_6) equivalent to Example 3.

High Res. ES-MS: 441.2074; calc. for $\text{C}_{24}\text{H}_{34}\text{O}_4\text{S}+\text{Na}$: 441.2076

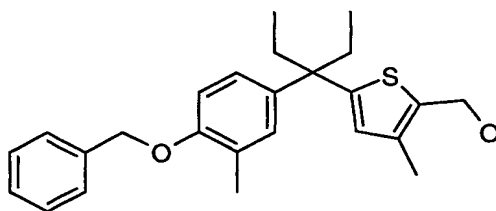
5

Example 9:

Preparation of 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methylsulfonylmethyl-4-methylthiophen-2-yl]pentane.



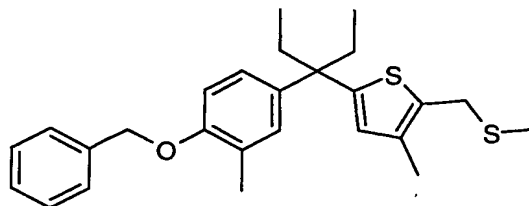
- 10 A. 3'-[4-(Benzyloxy)-3-methylphenyl]-3'-[4-methyl-5-(hydroxymethyl)thiophen-2-yl]pentane.



- To a 0 °C mixture of 3'-[4-(benzyloxy)-3-methylphenyl]-3'-[5—
- 15 methoxycarbonyl-4-methylthiophen-2-yl]pentane (1.55 g, 3.66 mmol) and THF (15 ml) is added LAH (417 mg, 11 mmol) and warmed to RT. The reaction is heated to 45 °C overnight and then cooled to 0 °C. The mixture is quenched with sat'd Na_2SO_4 , diluted with Et_2O , dried with Na_2SO_4 and filtered. After concentration, the residue is chromatographed (CHCl_3) to give the title compound (1.1 g, 76%).
- 20 ^1NMR (400MHz, DMSO- d_6) δ ppm: 0.64 (t, J = 7.3 Hz, 6H), 1.96-2.05 (m, 4H), 2.06 (s, 3H), 2.15 (s, 3H), 4.43 (s, 2H), 5.06 (m, 3H), 6.55 (s, 1H), 6.89 (d, J = 9.3 Hz, 1H), 7.26 (br s, 2H), 7.31 (m, 1H), 7.37 (m, 2H), 7.44 (d, J = 7.8 Hz, 2H).
- High Res. ES-MS: 377.1950; calc. for $\text{C}_{25}\text{H}_{30}\text{O}_2\text{S}+\text{H}-\text{H}_2\text{O}$: 377.1939

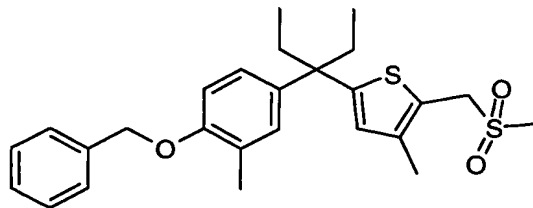
-166-

B. 3'-[4-(Benzyloxy)-3-methylphenyl]-3'-[4-methyl-5-(methylmercaptylmethyl)thiophen-2-yl]pentane.



- 5 To a 0 °C mixture of 3'-[4-(benzyloxy)-3-methylphenyl]-3'-[4-methyl-5-(hydroxymethyl)thiophen-2-yl]pentane (450 mg, 1.1 mmol) and Et₂O (3 ml) is added PBr₃ (113 ul, 1.2 mmol) and stirred for 1 h. The reaction is diluted with Et₂O, washed with water (1 X 5 ml), brine (1 X 5 ml), Na₂SO₄ dried, and concentrated. The resulting solid is dissolved in DMF, cooled to 0 °C, added NaSMe (330 mg, 4.8
- 10 mmol), and allowed to warmed RT. After stirring for 2 h, the reaction is concentrated and chromatographed (5% EtOAc/hex) to give the title compound (280 mg, 60%).
- ¹NMR (400MHz, DMSO-d₆) δ ppm: 0.63 (t, J = 7.3 Hz, 6H), 1.94-2.05 (m, 4H), 1.97 (s, 3H), 2.07 (s, 3H), 2.15 (s, 3H), 3.75 (s, 2H), 5.06 (s, 2H), 6.56 (s, 1H), 6.90 (d, J= 9.3 Hz, 1H), 7.01 (m, 2H), 7.31 (m, 1H), 7.38 (m, 2H), 7.44 (d, J = 6.8 Hz, 2H).
- 15 High Res. ES-MS: 425.1964; calc. for C₂₆H₃₂OS₂+H: 425.1973

C. 3'-[4-(Benzyloxy)-3-methylphenyl]-3'-[4-methyl-5-(methylsulfonylmethyl)thiophen-2-yl]pentane.



- 20 To a 0 °C mixture of 3'-[4-(benzyloxy)-3-methylphenyl]-3'-[4-methyl-5-(methylmercaptylmethyl)thiophen-2-yl]pentane (260 mg, 0.611 mmol) and CHCl₃ (3 ml) is added 50% m-CPBA (465 mg, 1.35 mmol) and stirred for 1.5 h. The reaction is diluted with CHCl₃, washed with satd Na₂CO₃, Na₂SO₄ dried, concentrated, and

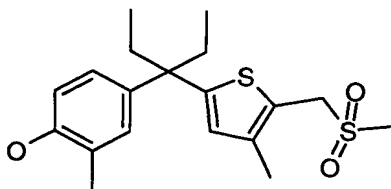
-167-

chromatographed (CHCl_3 to 5% EtOAc/ CHCl_3) to give the title compound as a white foamy solid (250 mg, 90%).

^1NMR (400MHz, DMSO-d_6) δ ppm: 0.64 (t, $J = 7.3$ Hz, 6H), 1.99-2.07 (m, 4H), 2.14 (s, 3H), 2.15 (s, 3H), 2.90 (s, 3H), 4.53 (s, 2H), 5.06 (s, 2H), 6.67 (s, 1H), 6.91 (d, $J = 9.3$ Hz, 1H), 7.03 (m, 2H), 7.31 (m, 1H), 7.38 (m, 2H), 7.44 (d, $J = 7.3$ Hz, 2H).

High Res. ES-MS: 474.2126; calc. for $\text{C}_{26}\text{H}_{32}\text{O}_3\text{S}_2 + \text{NH}_4$: 474.2137

D. 3'-[4-(Hydroxy)-3-methylphenyl]-3'-[4-methyl-5-(methylsulfonylmethyl)thiophen-2-yl]pentane.

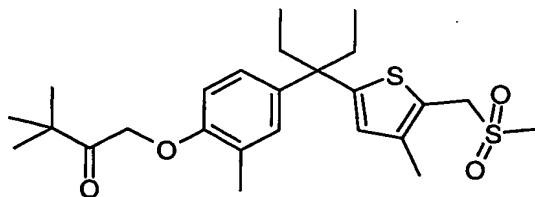


Using a procedure analogous to Example 1F, 3'-[4-(benzyloxy)-3-methylphenyl]-3'-[4-methyl-5-(methylsulfonylmethyl)thiophen-2-yl]pentane gives the title compound as a white foamy solid (160 mg, 81%).

^1NMR (400MHz, DMSO-d_6) δ ppm: 0.63 (t, $J = 7.3$ Hz, 6H), 1.94-2.03 (m, 4H), 2.06 (s, 3H), 2.14 (s, 3H), 2.89 (s, 3H), 4.52 (s, 2H), 6.65 (m, 2H), 6.85 (dd, $J = 2.4, 8.3$ Hz, 1H), 6.92 (d, $J = 2.0$ Hz, 1H), 9.09 (s, 1H).

High Res. ES-MS: 384.1648; calc. for $\text{C}_{19}\text{H}_{26}\text{O}_3\text{S}_2 + \text{NH}_4$: 384.1667

E. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methylsulfonylmethyl-4-methylthiophen-2-yl]pentane.



Using a procedure analogous to Example 1G, 3'-[4-(hydroxy)-3-methylphenyl]-3'-[4-methyl-5-(methylsulfonylmethyl)thiophen-2-yl]pentane gives the title compound (160 mg, 84%).

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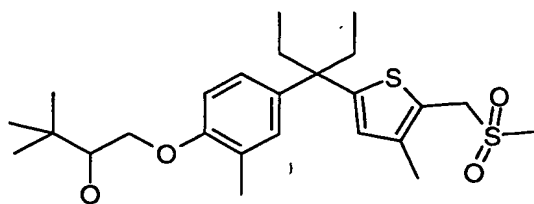
^1NMR (400MHz, DMSO- d_6) δ ppm: 0.63 (t, $J = 7.3$ Hz, 6H), 1.16 (s, 9H), 2.00-2.08 (m, 4H), 2.14 (s, 3H), 2.15 (s, 3H), 2.90 (s, 3H), 4.53 (s, 2H), 5.07 (s, 2H), 6.60 (d, $J = 8.3$ Hz, 1H), 6.67 (s, 1H), 6.97 (d, $J = 8.3$ Hz, 1H), 7.01 (s, 1H).

High Res. ES-MS: 482.2397; calc. for $\text{C}_{25}\text{H}_{26}\text{O}_4\text{S}_2 + \text{NH}_4$: 482.2399

5

Example 10:

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methylsulfonylmethyl-4-methylthiophen-2-yl]pentane.



10

Using a procedure analogous to Example 2, 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methylsulfonylmethyl-4-methylthiophen-2-yl]pentane gives the title compound as a white foamy solid (440 mg, quant.).

^1NMR (400MHz, DMSO- d_6) δ ppm: 0.62 (t, $J = 7.3$ Hz, 6H), 0.92 (s, 9H), 1.97-2.08 (m, 4H), 2.12 (s, 3H), 2.14 (s, 3H), 2.89 (s, 3H), 3.45 (m, 1H), 3.76 (dd, $J = 7.3, 9.8$ Hz, 1H), 4.02 (dd, $J = 2.9, 9.8$ Hz, 1H), 4.52 (s, 2H), 4.78 (d, $J = 5.4$ Hz, 1H), 6.66 (s, 1H), 6.82 (d, $J = 8.3$ Hz, 1H), 7.01 (m, 2H).

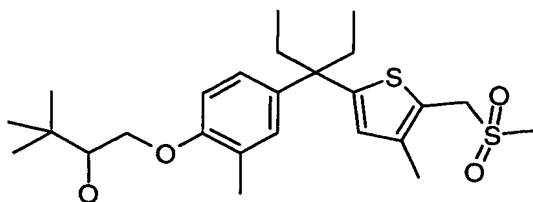
15

High Res. ES-MS: 484.2553; calc. for $\text{C}_{25}\text{H}_{38}\text{O}_4\text{S}_2 + \text{NH}_4$: 484.2555

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Example 11A and 11B

Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methylsulfonylmethyl-4-methylthiophen-2-yl]pentane.



5

A racemic mixture of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methylsulfonylmethyl-4-methylthiophen-2-yl]pentane is chromatographed with a Chiralcel AD column to give enantiomer 1, Example 11A (205 mg, ~50%) and enantiomer 2, Example 11B (150 mg, 38%).

10 Enantiomer 1, Example 11A

HPLC: Chiralcel AD (4.6X250 mm); 40% IPA/60% hept; 1 ml/m (flow rate); rt = 9.86 m; 260 nm.

¹NMR equivalent to Example 10.

High Res. ES-MS: 489.2127; calc. for C₂₅H₃₈O₄S₂+Na: 489.2109.

15 Enantiomer 2, Example 11B

HPLC: Chiralcel AD (4.6X250 mm); 40% IPA/60% hept; 1 ml/m (flow rate); rt = 12.64 m; 260 nm.

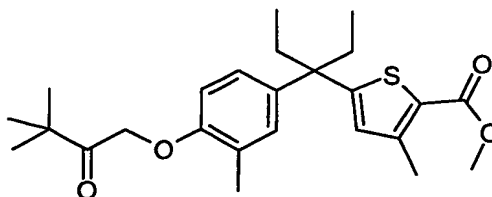
¹NMR equivalent to Example 10.

High Res. ES-MS: 489.2132; calc. for C₂₅H₃₈O₄S₂+Na: 489.2109.

20

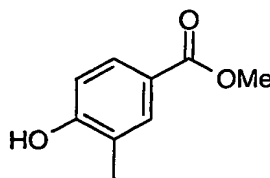
Example 12

Alternative preparation of 3'-[4-(2-oxo-3,3-dimethylbutoxy-3-methylphenyl)-3-methylphenyl]-3'-[5-methoxycarbonylmethyl-4-methylthiophen-2-yl]pentane (Example 1).



25 A. 4-Hydroxy-3-methylbenzoic acid methyl ester.

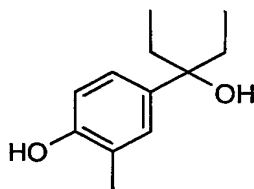
-170-



To a mixture of 3-methyl-4-hydroxybenzoic acid (342 g, 2.24 mol) in MeOH (3.5 l) is bubbled HCl (g) for 5 m. The mixture is stirred for 12 h at RT. The reaction is concentrated to give the title compound (372 g, quant).

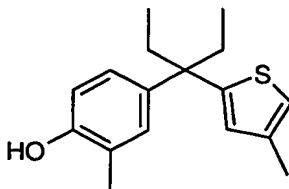
5 H-NMR (ppm, CDCl₃): 7.82 (1H, s), 7.78 (1H, dd,), 6.80 (1H, d), 3.86 (3H, s), 2.22 (3H, s).

B. 3'-[4-hydroxy-3-methylphenyl]pentan-3-ol].



10 To a 0 °C mixture of 4-hydroxy-3-methylbenzoic acid methyl ester (373 g, 2.24 mol) in THF (6 l) is added 3.0 M EtMgBr/Et₂O (2.3 l, 6.93 mol) over 3 h. The mixture is warmed to 40 °C for 2 h and cooled to 0 °C. Saturated NaHCO₃ is added slowly until gas evolution ceases and the reaction is partitioned between EtOAc/water. The organic layer is washed with brine, water, MgSO₄ dried and concentrated. The residue is dissolved in
15 CH₂Cl₂, dried with Na₂SO₄ and concentrated to give the title compound (440 g, quant).
H- NMR (ppm, CDCl₃): 7.06 (1H, s), 7.02 (1H, dd), 6.78 (1H, d), 4.60 (1H, s), 2.24 (3H, s), 1.80 (4H, m), 0.77 (6H, t).

C. 3'-[4-(Hydroxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane.



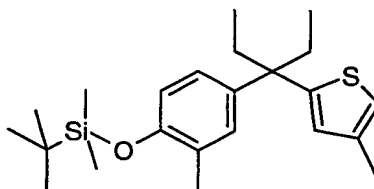
20 To a -78 °C mixture of 3'-[4-hydroxy-3-methylphenyl]pentan-3-ol] (415 g, 2.13 mol), 3-methylthiophene (627 g, 6.39 mol) and CH₂Cl₂ (6 l) is added BF₃- Et₂O (1.81 kg,

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12.8 mol), maintaining the temperature below -75°C . The reaction is warmed to RT for 3 h and cooled to 0°C . Saturated NaHCO_3 is added until the gas evolution ceases and the mixture is partitioned with water. The organic layer is dried with Na_2SO_4 , concentrated and chromatographed (EtOAc/hex) to give the title compound (425 g, 73%).

^1NMR (400MHz, $\text{DMSO}-d_6$) δ ppm: 0.63 (t, $J = 7.3$ Hz, 3H), 2.01 (m, 4H), 2.08 (s, 3H), 2.16 (s, 3H), 6.67 (m, 2H), 6.88 (m, 2H), 6.93 (d, $J = 1.9$ Hz, 1H), 9.10 (s, 1H). High Res. EI-MS: 274.1389; calc. for $\text{C}_{17}\text{H}_{22}\text{OS}$: 274.1391

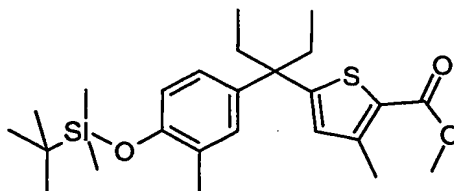
D. 3'-[4-(t-Butyldimethylsilyloxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane.



To a mixture of 3'-[4-(hydroxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane (5.00g, 187.2 mmol) and t-butyldimethylsilyl chloride (2.75g, 18.2 mmol) in CH_2Cl_2 (100 ml) is added imidazole (1.24g, 18.2 mmol). The reaction is stirred for 24 h at RT. The mixture is diluted with Hex (100 ml), filtered and concentrated. The concentrate is suspended in Hex (100 ml), filtered and concentrated to give the title compound as an oil (6.91 g, 98%).

H-NMR (ppm, CDCl_3): 7.05 (1H, d, 2.0 Hz), 6.97 (1H, d, 9.0 Hz), 6.72 (1H, d, 1.1 Hz), 6.68 (1H, d, 8.3 Hz), 6.62 (1H, d, 1.3 Hz), 2.23 (3H, s), 2.20 (3H, s), 2.10 (4H, m), 1.03 (9H, s), 0.72 (6H, t, 7.3 Hz), 0.23 (6H, s).

E. 3'-[4-(t-Butyldimethylsilyloxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.

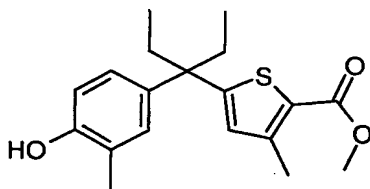


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To a -78°C mixture of 3'-[4-(t-butyltrimethylsilyloxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane (6.75 g, 17.4 mmol) and THF (100 ml) is added 2.5 M n-BuLi/hex (7.64 ml, 19.1 mmol). The mixture is stirred for 25 m and warmed to 0°C over 15 m. The reaction is cooled to -78°C , added methyl chloroformate (1.48 ml, 19.1 mmol) and warmed to RT overnight. To the reaction is added water (25 ml). The mixture is concentrated and partitioned with CH_2Cl_2 / water. The organic layer is concentrated to yield the title compound (7.8g, quant.).

H-NMR (ppm, CDCl_3): 6.99 (1H, d, 2.0 Hz), 6.94 (1H, dd, 2.3, 8.5 Hz), 6.67 (1H, d, 8.5 Hz), 6.62 (1H, s), 3.77 (3H, s), 2.49 (3H, s), 2.17 (3H, s), 2.09 (4H, m), 1.01 (9H, s), 0.70 (6H, t, 7.3 Hz), 0.22 (6H, s).

F. 3'-[4-Hydroxy-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.

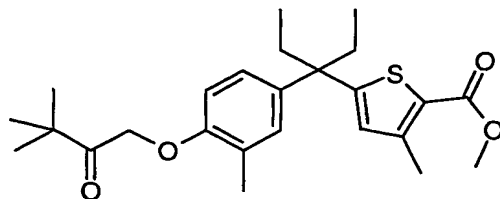


To a 0°C mixture of 3'-[4-(t-butyltrimethylsilyloxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (130 g, 292 mmol) and THF (1 L) is added 1.0 M TBAF/THF (292 ml, 292 mmol) over 20 m. The reaction is warmed to RT and stirred for 1 d. The mixture is concentrated and partitioned with CH_2Cl_2 / water. The organic layer is concentrated and chromatographed (EtOAc/hex) to give the title compound (40.2 g, 41%).

H-NMR (ppm, CDCl_3): 6.97 (1H, s), 6.95 (1H, d, 7.5 Hz), 6.69 (1H, d, 8.2 Hz), 6.61 (1H, s), 4.95 (1H, br s), 3.80 (3H, s), 2.47 (3H, s), 2.21 (3H, s), 2.08 (4H, m), 0.91 (3H, s), 0.70 (6H, t, 7.3 Hz).

G. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.

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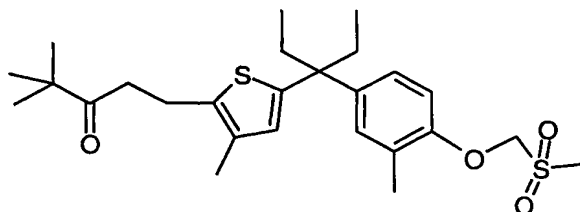


To a mixture of 3'-[4-hydroxy-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (14.5 g, 43.6 mmol), acetone (200 ml) and K_2CO_3 (12.1 g, 87.2 mmol) is added 3,3-dimethyl-1-chloro-2-butanone (5.73 ml, 43.6 mmol). The mixture is stirred overnight, refluxed for 9 h and cooled to RT overnight. The reaction is filtered and concentrated to give the title compound (18.8 g, quant.).

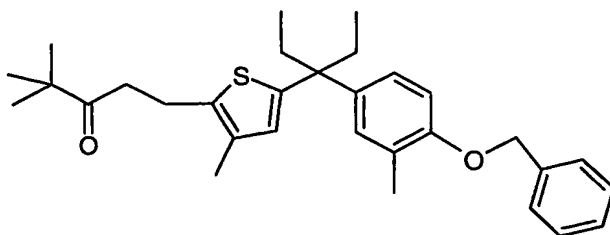
H-NMR (ppm, $CDCl_3$): 6.99 (2H, m), 6.60 (1H, s), 6.51 (1H, d, 8.5 Hz), 4.84 (2H, s), 3.79 (3H, s), 2.47 (3H, s), 2.25 (3H, s), 2.08 (4H, m), 1.25 (9H, s), 0.70 (6H, t, 7 Hz).

10 Example 13

Preparation of 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonylmethoxy)-3-methylphenyl]pentane.



15 H. 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-benzyloxy-3-methylphenyl]pentane.



To a 0 °C mixture of 3'-[4-(benzyloxy)-3-methylphenyl]-3'-[4-methyl-5-(hydroxymethyl)thiophen-2-yl]pentane (900 mg, 2.3 mmol) and Et_2O (7 ml) is added PBr_3 (240 μ l, 2.5 mmol) and stirred for 1.5 h. The reaction is diluted with Et_2O , washed with water (10 ml), brine (10 ml), Na_2SO_4 dried, and concentrated. The

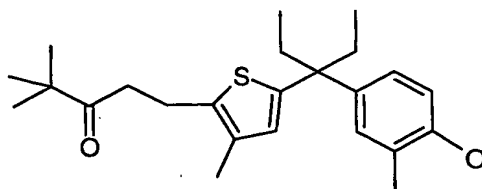
-174-

resulting residue is dissolved in THF (4 ml) and cooled to -78 °C to afford the bromide/THF solution. In a separate flask is charged with 1M LiHMDS (4.6 ml, 4.6 mmol), cooled to -78 C, and added pinacolone (570 ul, 4.6 mmol). The reaction is stirred for 1.5 h, warmed to -50 C and transferred (via syringe) to the -78 °C solution of bromide/THF. The reaction is warmed to RT with a cold water bath. After stirring for 15 m, the reaction is diluted with Et₂O and washed with 1N HCl. The organic layer is Na₂SO₄ dried and chromatographed (30% CHCl₃/hex to 80% CHCl₃/hex) to give the title compound (900 mg, 82%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 1.00 (s, 9H), 1.93-2.04 (m, 4H), 2.15 (s, 3H), 2.71 (m, 2H), 2.80 (m, 2H), 5.08 (s, 2H), 6.55 (s, 1H), 6.90 (d, J = 8.3 Hz, 1H), 7.01 (m, 2H), 7.34 (d, J = 7.3 Hz, 1H), 7.41 (m, 2H), 7.46 (d, J = 7.8 Hz, 2H).

High Res. ES-MS: 477.2830; calc. for C₃₁H₄₀O₂S+H: 477.2827.

I. 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-hydroxy-3-methylphenyl]pentane.



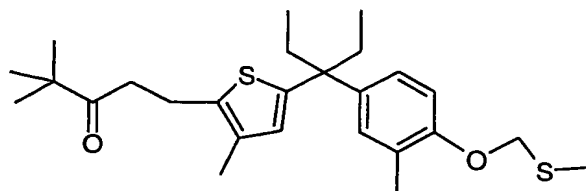
Using a procedure analogous to Example 1F, 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-benzyloxy-3-methylphenyl]pentane gives the title compound (600 mg, 97%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.59 (t, J = 7.3 Hz, 6H), 0.99 (s, 9H), 1.91-1.98 (m, 4H), 2.03 (s, 3H), 2.04 (s, 3H), 2.71 (m, 2H), 2.75 (m, 2H), 6.49 (s, 1H), 6.62 (d, J = 8.3 Hz, 1H), 6.82 (d, J = 8.3 Hz, 1H), 6.86 (s, 1H), 9.04 (s, 1H).

High Res. ES-MS: 409.2167; calc. for C₂₄H₃₄O₂S+Na: 409.2177.

J. 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylmercaptylmethoxy)-3-methylphenyl]pentane.

-175-

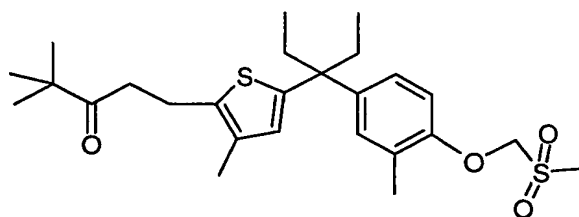


Using a procedure analogous to Example 1D, 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-hydroxy-3-methylphenyl]pentane and methylmercaptymethyl chloride give the title compound (440 mg, 73%).

- 5 ^1NMR (400MHz, DMSO- d_6) δ ppm: 0.61 (t, $J = 7.3$ Hz, 6H), 0.98 (s, 9H), 1.93-2.01 (m, 4H), 2.04 (s, 3H), 2.11 (s, 3H), 2.17 (s, 3H), 2.71 (m, 2H), 2.76 (m, 2H), 5.23 (s, 2H), 6.86 (d, $J = 8.3$ Hz, 1H), 6.98 (m, 2H).

High Res. ES-MS: 469.2230; calc. for $\text{C}_{26}\text{H}_{38}\text{O}_2\text{S}_2+\text{Na}$: 469.2211.

- 10 K. 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonylmethoxy)-3-methylphenyl]pentane.



Using a procedure analogous to Example 9C, 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylmercaptymethoxy)-3-

- 15 methylphenyl]pentane gives the title compound (140 mg, 33%).

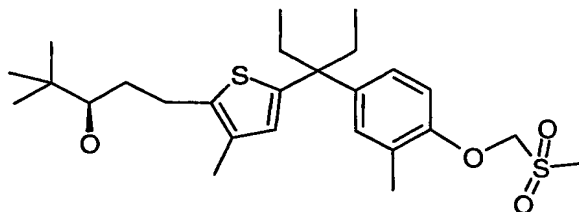
^1NMR (400MHz, DMSO- d_6) δ ppm: 0.61 (t, $J = 7.3$ Hz, 6H), 0.99 (s, 9H), 1.95-2.02 (m, 4H), 2.04 (s, 3H), 2.17 (s, 3H), 2.71 (m, 2H), 2.76 (m, 2H), 3.04 (s, 3H), 5.24 (s, 2H), 6.53 (s, 1H), 7.01 (m, 3H).

High Res. ES-MS: 501.2129; calc. for $\text{C}_{26}\text{H}_{38}\text{O}_4\text{S}_2+\text{Na}$: 501.2109.

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Example 14

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonylmethoxy)-3-methylphenyl]pentane.



5

Using a procedure analogous to Example 2, 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonylmethoxy)-3-methylphenyl]pentane gives the title compound (100 mg, quant.).

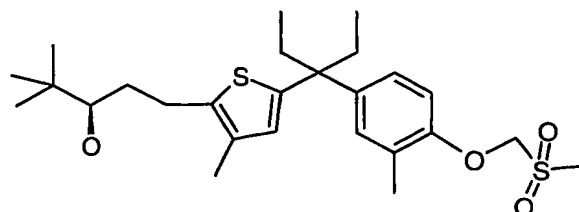
^1NMR (400MHz, DMSO- d_6) δ ppm: 0.62 (t, $J = 7.3$ Hz, 6H), 0.77 (s, 9H), 1.11-1.38 (m, 1H), 1.56-1.63 (m, 1H), 1.94-2.01 (m, 4H), 2.04 (s, 3H), 2.18 (s, 3H), 2.52-2.60 (m, 1H), 2.77-2.83 (m, 1H), 2.94-2.97 (m, 1H), 3.04 (s, 3H), 4.38 (d, $J = 5.9$, 1H), 5.25 (s, 2H), 6.53 (s, 1H), 7.01 (m, 3H).

10

High Res. ES-MS: 503.2268; calc. for $\text{C}_{26}\text{H}_{40}\text{O}_4\text{S}_2 + \text{Na}$: 503.2266.

15 **Example 15A and 15B**

Preparation of enantiomers of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonylmethoxy)-3-methylphenyl]pentane.



20

A mixture of racemic 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonylmethoxy)-3-methylphenyl]pentane is chromatographed with a Chiralcel OD column to give enantiomer 1

Example 3A (54 mg, 43%) and enantiomer 2, Example 3B (55 mg, 44%) .

Enantiomer 1, Example 3A]

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HPLC: Chiralcel OD (4.6X250 mm); 40% IPA/60% heptane; 1 ml/m (flow rate); rt = 8.9 m; 225 nm.

¹NMR equivalent to Example Yee-2.

High Res. ES-MS: 503.2269; calc. for C₂₆H₄₀O₄S₂+Na: 503.2266.

5 Enantiomer 2, Example 3B

HPLC: Chiralcel OD (4.6X250 mm);); 40% IPA/60% heptane; 1 ml/m (flow rate); rt = 11.3 m; 225 nm.

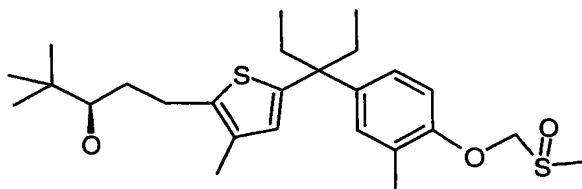
¹NMR equivalent to Example 2.

High Res. ES-MS: 503.2280; calc. for C₂₆H₄₀O₄S₂+Na: 503.2266.

10

Example 16

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfinylmethoxy)-3-methylphenyl]pentane.



15

To a 0 °C mixture of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylmercaptylmethoxy)-3-methylphenyl]pentane (725 mg, 1.67 mmol) and CHCl₃ (7 ml) is added 50% m-CPBA (1.3 g, 3.77 mmol). The stirred reaction is allowed to warm to RT over 1 h. The resulting suspension is added more CHCl₃ (7 ml) and stirred for 1 h. The mixture is diluted with CHCl₃ and washed with satd Na₂CO₃. The organic layer is concentrated and chromatographed (CHCl₃ to 50% EtOAc/ CHCl₃, TLC Rf: 0.05) to give the title compound (175 mg, 23%).

20

¹NMR (300MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.95-2.01 (m, 4H), 2.04 (s, 3H), 2.15 (s, 3H), 2.58 (m, 1H), 2.61 (s, 3H), 2.79 (m, 1H), 3.04 (m, 1H), 4.38 (m, 1H), 5.02 (d, J = 10.2 Hz, 1H), 5.20 (d, J = 10.7 Hz, 1H), 6.53 (s, 1H), 7.02 (m, 3H).

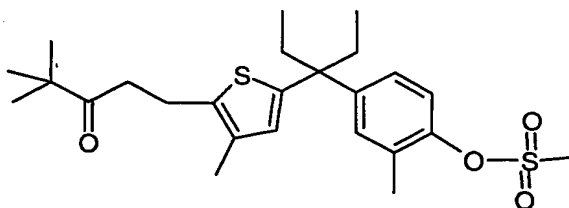
25

High Res. ES-MS: 465.2483; calc. for C₂₆H₄₀O₃S₂+H: 465.2497.

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Example 17

Preparation of 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]- 3'-[4-(methylsulfonyloxy)-3-methylphenyl]pentane.



5

Using a procedure analogous to Example 1D, 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]- 3'-[4-(hydroxy)-3-methylphenyl]pentane gives the title compound (425 mg, 65%).

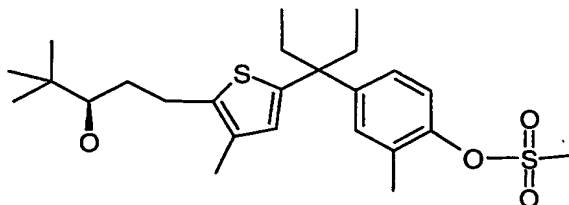
TLC: CHCl₃; R_f = 0.4.

10 ¹NMR (400MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.98 (s, 9H), 1.93-2.15 (m, 4H), 2.05 (s, 3H), 2.24 (s, 3H), 2.72 (m, 2H), 2.77 (m, 2H), 3.40 (s, 3H), 6.57 (s, 1H), 7.11 (d, J = 2.5 Hz, 1H), 7.19 (m, 2H).

High Res. ES-MS: 487.1940; calc. for C₂₅H₃₆O₄S₂+Na: 487.1940.

15 **Example 18**

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]- 3'-[4-(methylsulfonyloxy)-3-methylphenyl]pentane.



20 Using a procedure analogous to Example 2, 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]- 3'-[4-(methylsulfonyloxy)-3-methylphenyl]pentane gives the title compound (300 mg, 96%).

TLC: 5% EtOAc/CHCl₃; R_f = 0.35.

¹NMR (300MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.35 (m, 1H), 1.62 (m, 1H), 1.95-2.12 (m, 4H), 2.04 (s, 3H), 2.25 (s, 3H), 2.60 (m, 1H), 2.81

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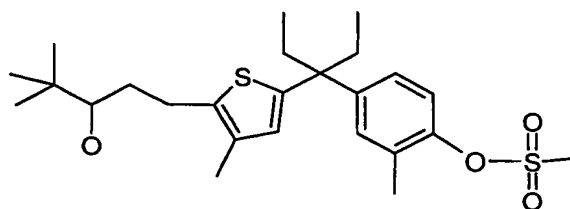
(m, 1H), 2.98 (m, 1H), 3.42 (s, 3H), 4.37 (d, $J = 6.2$ Hz, 1H), 6.59 (s, 1H), 7.13 (dd, $J = 2.2, 8.8$ Hz, 1H), 7.22 (m, 2H).

High Res. ES-MS: 484.2539; calc. for $C_{25}H_{38}O_4S_2 + NH_4$: 484.2555.

5

Example 19A and 19B

Preparation of enantiomers of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonyloxy)-3-methylphenyl]pentane.



10

A mixture of racemic 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methylsulfonyloxy)-3-methylphenyl]pentane is chromatographed with a Chiralcel AD column to give enantiomer 1, Example 19A (108 mg, 43%) and enantiomer 2, Example 19B (109 mg, 44%).

15 Enantiomer 1, Example 19A

HPLC: Chiralcel AD (4.6X250 mm); 10% IPA/heptane; 1 ml/m (flow rate); $rt = 6.85$ m; 250 nm.

1H NMR equivalent to Example 18.

High Res. ES-MS: 489.2106; calc. for $C_{25}H_{38}O_4S_2 + Na$: 489.2109.

20 Enantiomer 2, Example 19B.

HPLC: Chiralcel AD (4.6X250 mm); 10% IPA/heptane; 1 ml/m (flow rate); $rt = 8.00$ m; 250 nm.

1H NMR equivalent to Example 18..

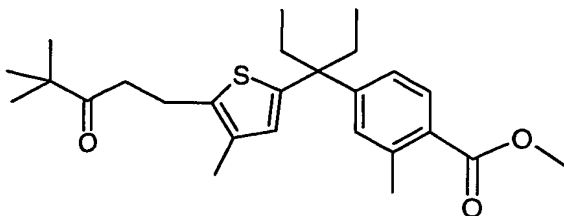
High Res. ES-MS: 489.2112; calc. for $C_{25}H_{38}O_4S_2 + Na$: 489.2109.

25

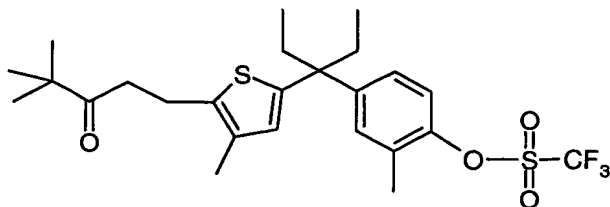
Example 20

Preparation of 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-methoxycarbonyl-3-methylphenyl]pentane.

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A. 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(trifluoromethylsulfonyloxy)-3-methylphenyl]pentane.



5 To a 0 °C mixture of 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-hydroxy-3-methylphenyl]pentane (2.7 g, 7.0 mmol) and pyridine (8 ml) is added Tf₂O (1.3 ml, 7.7 mmol). The reaction is warmed to RT and stirred overnight. The reaction is diluted with Et₂O, washed with 1N HCl and brine, Na₂SO₄ dried, and concentrated. The residue is chromatographed (30 /hex) to give the title compound
10 (2.9 g, 80%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.61 (t, J = 7.3 Hz, 6H), 0.97 (s, 9H), 1.95-2.11 (m, 4H), 2.04 (s, 3H), 2.28 (s, 3H), 2.70 (m, 2H), 2.77 (m, 2H), 6.59 (s, 1H), 7.19 (dd, J = 2.4, 8.8 Hz, 1H), 7.24 (d, J = 8.8 Hz, 1H), 7.30 (d, J = 2.0 Hz, 1H).

High Res. ES-MS: 519.1838; calc. for C₂₅H₃₃F₃O₄S₂+H: 519.1851.

15

B. 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-methoxycarbonyl-3-methylphenyl]pentane.

A mixture of 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(trifluoromethylsulfonyloxy)-3-methylphenyl]pentane (2.65 g, 5.1 mmol), DPPF (554
20 mg, 1.0 mmol), Pd(OAc)₂ (120 mg, 0.51 mmol), DMF (10 ml), MeOH (2.1 ml) and Et₃N (2.1 ml, 15.3 mmol) is heated in an autoclave at 110 °C under CO pressure (1000 psi). After 48 h, the reaction is cooled to RT and diluted with Et₂O. The mixture is washed with 5N HCl, water, and Na₂SO₄ dried and concentrated. The residue is
25 chromatographed (10% EtOAc/hex) to give the title compound (1.86 g, 85%).

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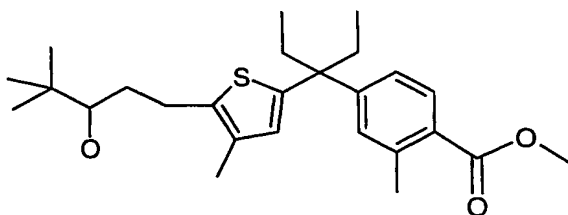
^1NMR (400MHz, DMSO-d_6) δ ppm: 0.61 (t, $J = 7.3$ Hz, 6H), 0.98 (s, 9H), 1.96-2.12 (m, 4H), 2.04 (s, 3H), 2.47 (s, 3H), 2.71 (m, 2H), 2.78 (m, 2H), 3.79 (s, 3H), 6.56 (s, 1H), 7.15 (m, 2H), 7.71 (d, $J = 7.8$ Hz, 1H).

High Res. ES-MS: 446.2741; calc. for $\text{C}_{26}\text{H}_{36}\text{O}_3\text{S}+\text{NH}_4$: 446.2729.

5

Example 21

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]- 3'-[4-methoxycarbonyl-3-methylphenyl]pentane.



10

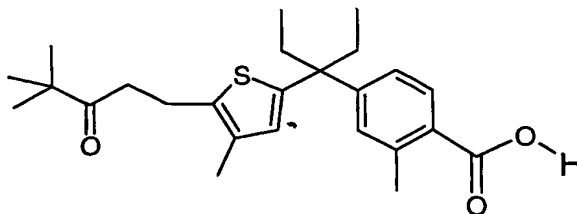
Using a procedure analogous to Example 2, 3'-[5-(3-Oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]- 3'-[4-methoxycarbonyl-3-methylphenyl]pentane gives the title compound (785 mg, 98%).

^1NMR (400MHz, DMSO-d_6) δ ppm: 0.63 (t, $J = 7.3$ Hz, 6H), 0.77 (s, 9H), 1.35 (m, 1H), 1.54 (m, 1H), 1.98-2.13 (m, 4H), 2.04 (s, 3H), 2.48 (s, 3H), 2.56 (m, 1H), 2.79 (m, 1H), 2.95 (m, 1H), 3.79 (s, 3H), 4.37 (br s, d, 1H), 6.57 (s, 1H), 7.17 (m, 2H), 7.72 (d, $J = 7.8$ Hz, 1H).

High Res. ES-MS: 431.2630; calc. for $\text{C}_{26}\text{H}_{38}\text{O}_3\text{S}+\text{H}$: 431.2620.

Example 22

Preparation of 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]- 3'-[4-carboxyl-3-methylphenyl]pentane.



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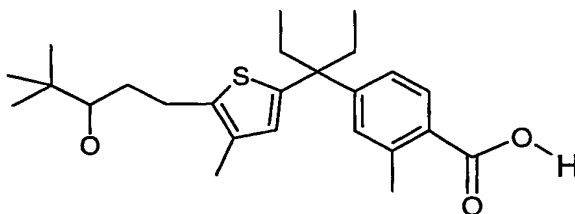
Using a procedure analogous to Example 3, 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-methoxycarbonyl-3-methylphenyl]pentane gives the title compound (800 mg, 92%).

- 5 ^1NMR (400MHz, DMSO- d_6) δ ppm: 0.62 (t, $J = 7.3$ Hz, 6H), 0.98 (s, 9H), 1.96-2.11 (m, 4H), 2.04 (s, 3H), 2.47 (s, 3H), 2.71 (m, 2H), 2.77 (m, 2H), 6.56 (s, 1H), 7.11 (m, 2H), 7.71 (d, $J = 8.3$ Hz, 1H), 12.64 (s, 1H).

High Res. ES-MS: 415.2297; calc. for $\text{C}_{25}\text{H}_{34}\text{O}_3\text{S}+\text{H}$: 415.2307.

10 Example 23

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-carboxyl-3-methylphenyl]pentane.



- 15 Using a procedure analogous to Example 3, 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-methoxycarbonyl-3-methylphenyl]pentane gives the title compound (700 mg, 99%).

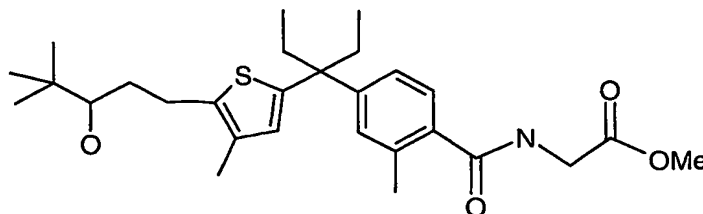
- ^1NMR (400MHz, DMSO- d_6) δ ppm: 0.62 (t, $J = 7.3$ Hz, 6H), 0.77 (s, 9H), 1.36 (m, 1H), 1.58 (m, 1H), 1.96-2.11 (m, 4H), 2.04 (s, 3H), 2.48 (s, 3H), 2.55 (m, 1H), 2.60 (m, 1H), 4.37 (d, $J = 6.2$ Hz, 1H), 6.58 (s, 1H), 7.17 (m, 2H), 7.73 (d, $J = 8.1$ Hz, 1H), 12.65 (br s, 1H).

High Res. ES-MS: 439.2322; calc. for $\text{C}_{25}\text{H}_{36}\text{O}_3\text{S}+\text{Na}$: 439.2283.

Example 24

- 25 Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethylaminocarbonyl)-3-methylphenyl]pentane.

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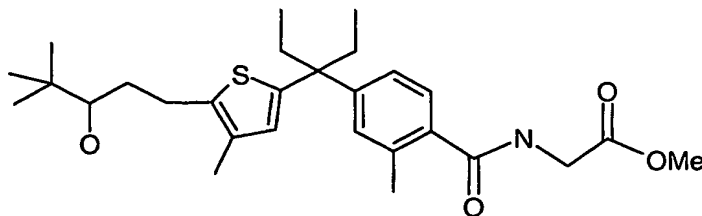
To a mixture of DMAP (256 mg, 2.1 mmol), methyl glycinate hydrochloride (123 mg, 1.01 mmol), EDCI (193 mg, 1.01 mmol) and CH₂Cl₂ (4 ml) is added 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-carboxyl-3-methylphenyl]pentane (350 mg, 0.84 mmol). The reaction is added CH₂Cl₂ (2 ml) and DMF (1 ml). The mixture is stirred for 16 h and concentrated. The residue is diluted with Et₂O, 1N HCl (3X), brine and Na₂SO₄ dried. The organic solution is concentrated and chromatographed (20% EtOAc/CHCl₃ to 50% EtOAc/CHCl₃) to give the title compound (320 mg, 78%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.64 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.35 (m, 1H), 1.57 (m, 1H), 1.98-2.12 (m, 4H), 2.32 (s, 3H), 2.53-2.61 (m, 1H), 2.77-2.84 (m, 1H), 2.95 (m, 1H), 3.65 (s, 3H), 3.94 (d, J = 5.9 Hz, 2H), 4.39 (br s, 1H), 6.56 (s, 1H), 7.11 (m, 2H), 7.26 (d, J = 8.3 Hz, 1H), 8.62 (t, J = 5.9 Hz, 1H).

ES-MS: 488.2 (M+H).

Example 25A and 25B

Preparation of enantiomers of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethylaminocarbonyl)-3-methylphenyl]pentane.



A racemic mixture of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethylaminocarbonyl)-3-methylphenyl]pentane is

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chromatographed with a Chiralcel AD column to give enantiomer 1, Example 25A (110 mg, 37%) and enantiomer 2, Example 25B (102 mg, 34%) .

Enantiomer 1, Example 25A

HPLC: Chiralcel AD (4.6X250 mm); 10% IPA/heptane; 1 ml/m (flow rate); t_r = 16.90 m; 240 nm.

^1NMR equivalent to Example 24.

High Res. ES-MS: 488.2812; calc. for $\text{C}_{28}\text{H}_{41}\text{NO}_4\text{S}+\text{H}$: 488.2835.

Enantiomer 2, Example 25B.

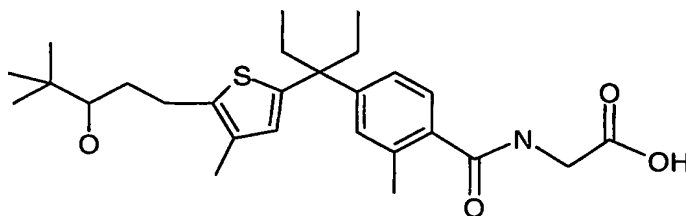
HPLC: Chiralcel AD (4.6X250 mm); 10% IPA/heptane; 1 ml/m (flow rate); t_r = 20.00 m; 240 nm.

^1NMR equivalent to Example 24.

High Res. ES-MS: 488.2831; calc. for $\text{C}_{28}\text{H}_{41}\text{NO}_4\text{S}+\text{H}$: 488.2835.

Example 26

Preparation of isomer 1 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(carboxymethylaminocarbonyl)-3-methylphenyl]pentane.



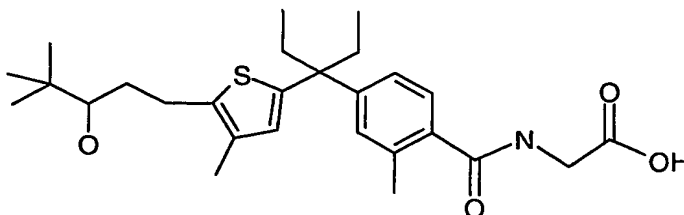
Using a procedure analogous to Example 3 but reacted at 50 °C, isomer 1 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethylaminocarbonyl)-3-methylphenyl]pentane (Example 13A) gives the title compound (95 mg, 98%).

^1NMR (400MHz, $\text{DMSO}-d_6$) δ ppm: 0.64 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.34 (m, 1H), 1.58 (m, 1H), 1.97-2.12 (m, 4H), 2.04 (s, 3H), 2.32 (s, 3H), 2.57 (m, 1H), 2.80 (m, 1H), 2.95 (m, 1H), 3.84 (d, J = 6.3 Hz, 1H), 4.38 (br s, 1H), 6.56 (s, 1H), 7.10 (m, 2H), 7.26 (d, J = 8.8 Hz, 1H), 8.48 (t, J = 6.3 Hz, 1H), 12.47 (br s, 1H).

High Res. ES-MS: 474.2689; calc. for $\text{C}_{27}\text{H}_{39}\text{NO}_4\text{S}+\text{H}$: 474.2678.

Example 27

Preparation of isomer 2 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(carboxymethylaminocarbonyl)-3-methylphenyl]pentane.



5

Using a procedure analogous to Example 3 except using LiOH at 60 °C, isomer 2 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethylaminocarbonyl)-3-methylphenyl]pentane gives the title compound (79 mg, 94%).

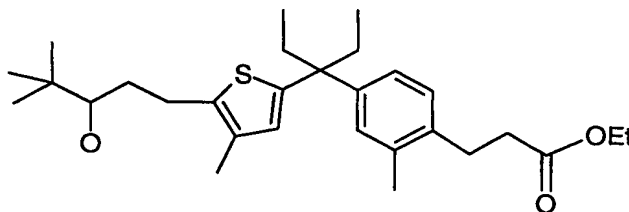
10 ¹NMR equivalent to Example 26.

High Res. ES-MS: 474.2672; calc. for C₂₇H₃₉NO₄S+H: 474.2678.

Example 28

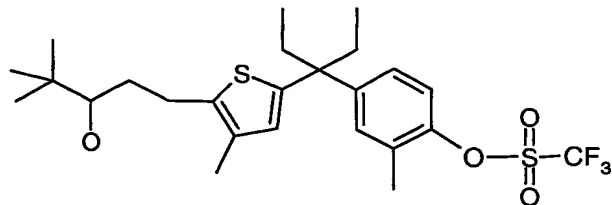
Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(ethoxycarbonylethyl)-3-methylphenyl]pentane.

15



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3'-[5-(3-Hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(trifluoromethylsulfonyloxy)-3-methylphenyl]pentane.



Using a procedure analogous to Example 8A, isomer 1 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-hydroxy-3-methylphenyl]pentane gives the title compound (1.1 g, 64%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.63 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.35 (m, 1H), 1.59 (m, 1H), 1.97-2.12 (m, 4H), 2.04 (s, 3H), 2.29 (s, 3H), 2.58 (m, 1H), 2.80 (m, 1H), 2.94 (m, 1H), 4.38 (br s, 1H), 6.59 (s, 1H), 7.21 (dd, J = 2.4, 8.8 Hz, 1H), 7.26 (m, 2H), 7.33 (d, J = 2.0 Hz, 1H).

High Res. EI-MS: 520.1927; calc. for C₂₅H₃₅F₃O₄S₂: 520.1929.

A. 3'-[5-(3-Hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(ethoxycarbonylethyl)-3-methylphenyl]pentane:

To a 0 °C mixture of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(trifluoromethylsulfonyloxy)-3-methylphenyl]pentane (1.08 g, 2.07 mmol), Pd(Dppf)2Cl₂ (170 mg, 0.207 mmol), LiCl (350 mg, 8.3 mmol) and THF (1 ml) is added 0.5M of 2-(ethoxycarbonyl)ethylzinc bromide/THF (12.4 ml, 6.21 mmol). The reaction is heated to 60 °C for 1 h and concentrated (to ~8 ml of volume) with a stream of nitrogen. The reaction is heated under nitrogen for another 15 h. After cooling, the reaction is diluted with Et₂O, quenched with 2.5N HCl, washed with water, Na₂SO₄ dried, and concentrated. The residue is chromatographed (70% CHCl₃/hex to 100% CHCl₃) to give the title compound (550 mg, 56%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.61 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.14 (t, J = 6.8 Hz, 3H), 1.33 (m, 1H), 1.58 (m, 1H), 1.93-2.19 (m, 4H), 2.04 (s, 3H), 2.22 (s, 3H),

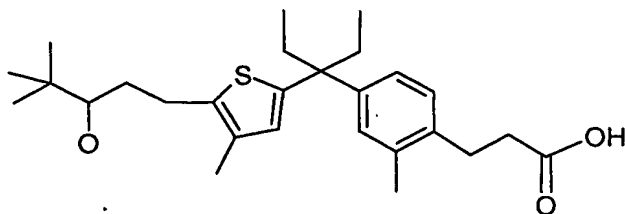
-187-

2.51-2.59 (m, 3H), 2.75-2.83 (m, 3H), 2.95 (m, 1H), 4.02 (q, $J = 7.3$ Hz, 2H), 4.38 (br s, 1H), 6.53 (s, 1H), 6.98 (m, 3H).

High Res. ES-MS: 495.2926; calc. for $C_{29}H_{44}O_3S+Na$: 495.2909.

5 Example 29

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(2-carboxylethyl)-3-methylphenyl]pentane.



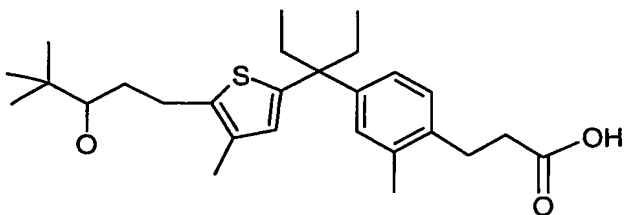
Using a procedure analogous to Example 3 but reacted at RT for 45 m, 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(2-ethoxycarbonylethyl)-3-methylphenyl]pentane gives the title compound (450 mg, 95%).

^1NMR (400MHz, DMSO-d_6) δ ppm: 0.62 (t, $J = 7.3$ Hz, 6H), 0.77 (s, 9H), 1.34 (m, 1H), 1.59 (m, 1H), 1.97-2.19 (m, 4H), 2.04 (s, 3H), 2.21 (s, 3H), 2.45 (t, $J = 7.3$ Hz, 2H), 2.54 (m, 1H), 2.74 (t, $J = 8.3$ Hz, 2H), 2.79 (m, 1H), 2.96 (m, 1H), 4.38 (br s, 1H), 6.53 (s, 1H), 6.99 (m, 3H), 12.09 (br s, 1H).

ES-MS: 445.3 (M+H).

Example 30A and 30B

Preparation of enantiomers of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(2-carboxylethyl)-3-methylphenyl]pentane.



A racemic mixture of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(2-carboxylethyl)-3-methylphenyl]pentane is chromatographed with a Chiralcel

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AD column to give enantiomer 1, Example 30A (108 mg, 43%) and enantiomer 2, Example 30B (109 mg, 44%) .

Enantiomer 1, Example 30A

HPLC: Chiralcel AD (4.6X250 mm); 0.1% TFA in 5% EtOH/hept; 1 ml/m (flow rate); rt = 8.20 m; 210 nm.

^1NMR (300MHz, DMSO- d_6) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.35 (m, 1H), 1.61 (m, 1H), 1.97-2.10 (m, 4H), 2.04 (s, 3H), 2.22 (s, 3H), 2.47 (m, 2H), 2.56 (m, 1H), 2.77 (m, 3H), 2.95 (m, 1H), 4.37 (d, J = 6.2 Hz, 1H), 6.54 (s, 1H), 7.02 (m, 3H), 12.12 (br s, 1H).

High Res. ES-MS: 462.3054; calc. for $\text{C}_{27}\text{H}_{40}\text{NO}_3\text{S}+\text{NH}_4$: 462.3042.

Enantiomer 2, Example 30B.

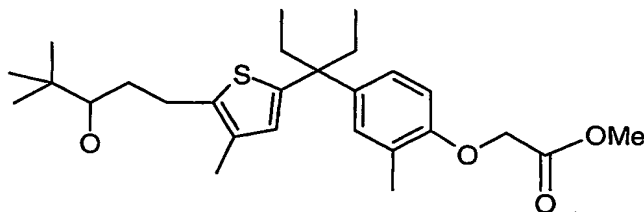
HPLC: Chiralcel AD (4.6X250 mm); 0.1% TFA in 5% EtOH/hept; 1 ml/m (flow rate); rt = 10.09 m; 210 nm.

^1NMR equivalent to Example 29.

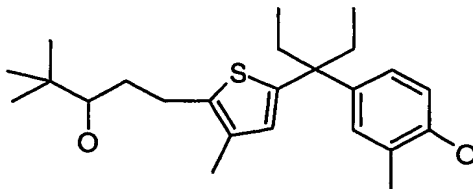
High Res. ES-MS: 462.3057; calc. for $\text{C}_{27}\text{H}_{40}\text{NO}_3\text{S}+\text{NH}_4$: 462.3042.

Example 31

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethoxy)-3-methylphenyl]pentane.



A. 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-hydroxy-3-methylphenyl]pentane.



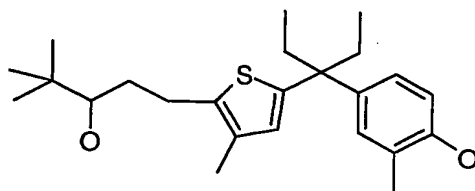
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Using a procedure analogous to Example 2, 3'-[5-(3-oxo-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-hydroxy-3-methylphenyl]pentane gives the title compound (4.6 g, 98%).

¹NMR (300MHz, DMSO-d₆) δ ppm: 0.61 (t, J = 7.3 Hz, 6H), 0.78 (s, 9H), 1.35 (m, 1H), 1.57 (m, 1H), 1.87-2.11 (m, 4H), 2.04 (s, 3H), 2.06 (s, 3H), 2.58 (m, 1H), 2.96 (dd, J = 6.2, 9.1 Hz, 1H), 4.36 (d, J = 6.2 Hz, 1H), 6.51 (s, 1H), 6.65 (d, J = 8.1 Hz, 1H), 6.85 (dd, J = 2.2, 8.4 Hz, 1H), 6.90 (s, 1H), 9.03 (s, 1H).

High Res. ES-MS: 389.2502; calc. for C₂₄H₃₆O₂S+H: 389.2514.

10 B. 3'-[5-(3-Hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethoxy)-3-methylphenyl]pentane.



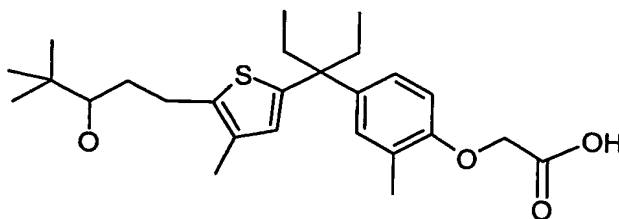
15 Using a procedure analogous to Example 1D, 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-hydroxy-3-methylphenyl]pentane is reacted with NaH and methyl chloroacetate to give the title compound (1.85 g, 92%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.78 (s, 9H), 1.35 (m, 1H), 1.58 (m, 1H), 1.92-2.02 (m, 4H), 2.04 (s, 3H), 2.14 (s, 3H), 2.55 (m, 1H), 2.78 (m, 1H), 2.95 (m, 1H), 3.69 (s, 3H), 4.38 (br s, 1H), 4.78 (s, 2H), 6.53 (s, 1H), 6.69 (d, J = 8.3 Hz, 1H), 6.98 (m, 2H).

20 High Res. ES-MS: 461.2738; calc. for C₂₇H₄₀O₄S+H: 461.2726.

Example 32

Preparation of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(carboxymethoxy)-3-methylphenyl]pentane.



Using a procedure analogous to Example 3, 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(methoxycarbonylmethoxy)-3-methylphenyl]pentane gives the title compound (1.4 g, 80%).

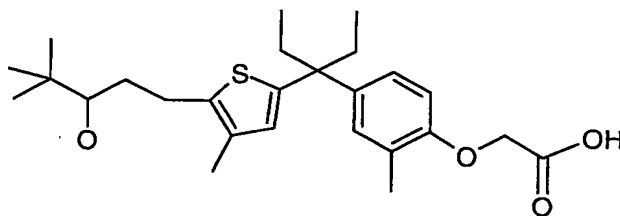
- 5 ^1NMR (300MHz, DMSO-d_6) δ ppm: 0.62 (t, $J = 7.3$ Hz, 6H), 0.78 (s, 9H), 1.59 (m, 1H), 1.61 (m, 1H), 1.90-2.07 (m, 4H), 2.04 (s, 3H), 2.14 (s, 3H), 2.58 (m, 1H), 2.78 (m, 1H), 2.96 (m, 1H), 4.37 (d, $J = 6.2$ Hz, 1H), 4.64 (s, 2H), 6.53 (s, 1H), 6.68 (d, $J = 9.1$ Hz, 1H), 7.00 (m, 2H), 12.92 (br s, 1H).

High Res. ES-MS: 469.2392; calc. for $\text{C}_{26}\text{H}_{38}\text{O}_4\text{S}+\text{Na}$: 469.2389.

10

Example 33A & 33B

Preparation of enantiomers of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(carboxymethoxy)-3-methylphenyl]pentane.



15

A racemic mixture of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(carboxymethoxy)-3-methylphenyl]pentane is chromatographed with a Chiralcel OJ column to give enantiomer 1, Example 33A (600 mg, 46%) and enantiomer 2, Example 33B (600 mg, 46%).

- 20 Enantiomer 1, Example 33A

HPLC: Chiralcel OJ (4.6X250 mm); 0.1% TFA in (2% MeOH and 5% EtOH in hept); 0.6 ml/m (flow rate); $r_t = 7.10$ m; 240 nm.

^1NMR equivalent to Example 32.

High Res. ES-MS: 469.2393; calc. for $\text{C}_{26}\text{H}_{38}\text{O}_4\text{S}+\text{Na}$: 469.2389.

- 25 Enantiomer 2, Example 33B.

HPLC: Chiralcel OJ (4.6X250 mm); 0.1% TFA in (2% MeOH and 5% EtOH in hept); 0.6 ml/m (flow rate); $r_t = 10.50$ m; 240 nm.

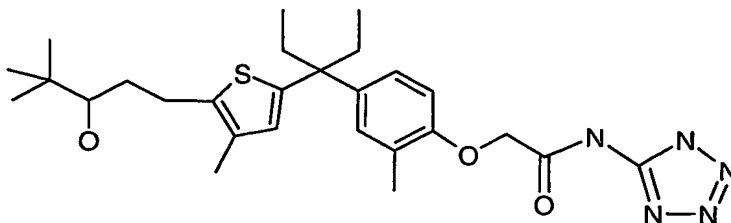
^1NMR equivalent to Example 32.

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High Res. ES-MS: 469.2385; calc. for $C_{26}H_{38}O_4S+Na$: 469.2389.

Example 34

Preparation of isomer 1 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(tetrazol-5-yl-aminocarbonylmethoxy)-3-methylphenyl]pentane.



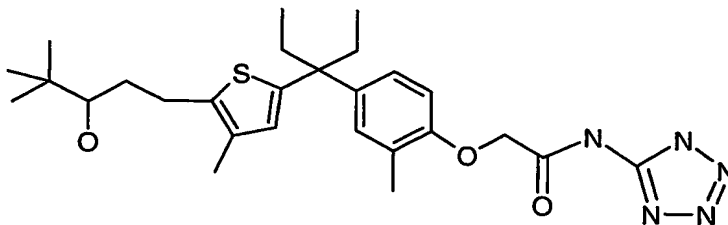
Using a procedure analogous to Example 24 and crystallization from Et₂O/hex, enantiomer 1 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(carboxymethoxy)-3-methylphenyl]pentane (Example 33A) and 5-aminotetrazole give the title compound as a white solid (45 mg, 20%).

¹NMR (400MHz, DMSO-d₆) δ ppm: 0.62 (t, J = 7.3 Hz, 6H), 0.77 (s, 9H), 1.33 (m, 1H), 1.57 (m, 1H), 1.92-2.00 (m, 4H), 2.04 (s, 3H), 2.19 (s, 3H), 2.56 (m, 1H), 2.78 (m, 1H), 2.95 (m, 1H), 4.38 (d, J = 6.3 Hz, 1H), 4.86 (s, 2H), 6.52 (s, 1H), 6.72 (d, J = 8.8 Hz, 1H), 6.99 (m, 2H), 12.21 (br s, 1H), 15.97 (br s, 1H).

High Res. ES-MS: 536.2677; calc. for $C_{27}H_{39}O_3N_5S+Na$: 536.2671.

Example 35

Preparation of isomer 2 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(tetrazol-5-yl-aminocarbonylmethoxy)-3-methylphenyl]pentane.



Using a procedure analogous to Example 24 with crystallization from Et₂O/hex, enantiomer 2 of 3'-[5-(3-hydroxy-4,4-dimethylpentyl)-4-methylthiophen-2-yl]-3'-[4-(carboxymethoxy)-3-methylphenyl]pentane (Example 33B) and 5-aminotetrazole give the title compound as a white solid (70 mg, 32%).

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¹NMR equivalent to Example 34.

High Res. ES-MS: 536.2690; calc. for C₂₇H₃₉O₃N₅S+Na: 536.2671.

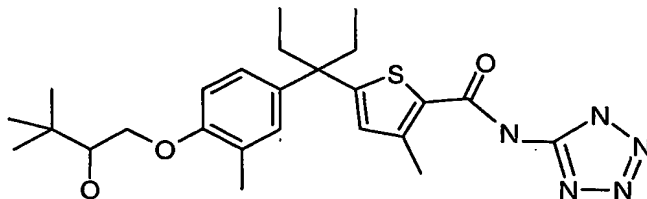
Add Preparation of racemic 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-

5 3'-[5-(tetrazol-5-yl-aminocarbonyl)-4-methylthiophen-2-yl]pentane.

Example 36

Preparation of isomer 1 of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-

3'-[5-(tetrazol-5-yl-aminocarbonyl)-4-methylthiophen-2-yl]pentane.



Using a procedure analogous to Example 24 and crystallization from CH₂Cl₂, enantiomer 1 of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-carboxyl-4-methylthiophen-2-yl]pentane (Example 7) and 5-aminotetrazole give the title compound as a white solid (335 mg, 77%).

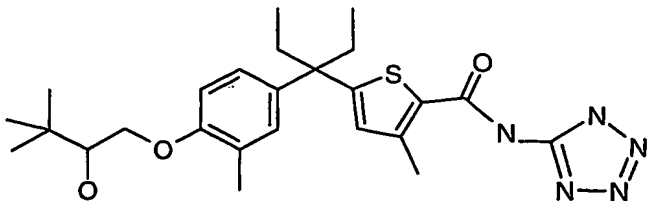
¹NMR (300MHz, DMSO-d₆) δ ppm: 0.67 (t, J = 7.3 Hz, 6H), 0.93 (s, 9H), 2.00-2.15 (m, 4H), 2.13 (s, 3H), 2.46 (s, 3H), 3.46 (m, 1H), 3.77 (dd, J = 7.3, 9.9 Hz, 1H), 4.04 (dd, J = 2.9, 10.2 Hz, 1H), 4.80 (d, J = 5.5 Hz, 1H), 6.87 (m, 2H), 7.04 (m, 2H), 11.80 (s, 1H), 15.92 (br s, 1H).

High Res. ES-MS: 486.2556; calc. for C₂₅H₃₅O₃N₅S+H: 486.2539.

Example 37

Preparation of isomer 2 of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-

3'-[5-(tetrazol-5-yl-aminocarbonyl)-4-methylthiophen-2-yl]pentane.



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Using a procedure analogous to Example 24 and crystallization from CH₂Cl₂, enantiomer 2 of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-carboxyl-4-methylthiophen-2-yl]pentane (Example 8) and 5-aminotetrazole give the title compound as a white solid (335 mg, 77%).

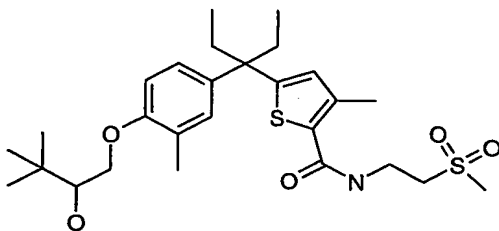
5 ¹NMR (300MHz, DMSO-d₆) δ ppm: 0.67 (t, J = 7.3 Hz, 6H), 0.93 (s, 9H), 2.00-2.15 (m, 4H), 2.13 (s, 3H), 2.46 (s, 3H), 3.46 (m, 1H), 3.77 (dd, J = 7.3, 9.9 Hz, 1H), 4.04 (dd, J = 2.9, 10.2 Hz, 1H), 4.80 (d, J = 5.1 Hz, 1H), 6.87 (m, 2H), 7.04 (m, 2H), 11.80 (s, 1H), 15.92 (br s, 1H).

High Res. ES-MS: 486.2545; calc. for C₂₅H₃₅O₃N₅S+H: 486.2539.

10

Example 38

Preparation of 5-[1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methylphenyl]propyl]-3-methylthiophene-2-carboxylic acid (2-methylsulfonyl-ethyl) amide.



15

To a mixture of 5-[1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl]-3-methyl-thiophene-2-carboxylic acid (0.6344 g, 1.52 mmol) and CH₂Cl₂ (10 mL) is added Et₃N (0.85 mL, 6.07 mmol), followed by hydrochloride salt of 2-aminoethylmethylsulfone (0.2416 g, 1.52 mmol), EDCI (0.320 g, 1.67 mmol), and HOBT (0.226 g, 1.67 mmol). The resulting solution is stirred at RT overnight, diluted with CH₂Cl₂ (30 mL), washed with 1.0 M HCl (3 x 20 mL), brine (20 mL), dried over MgSO₄, and concentrated. The resulting residue is purified by chromatography (50% EtOAc/Hex) to give the titled compound (0.4042 g, 0.77 mmol, 51%). ¹H NMR (CDCl₃), δ 0.71 (t, J = 7.3 Hz, 6H), 1.03 (s, 9H), 2.09 (q, J = 7.3 Hz, 4H), 2.21 (s, 3H), 2.42 (d, J = 3.0 Hz, 1H), 2.46 (s, 3H), 2.98 (s, 3H), 3.32 (t, J = 6.4 Hz, 2H), 3.71 (dt, J = 8.9, 2.9 Hz, 1H), 3.84-3.94 (m, 3H), 4.10 (dd, J = 9.3, 2.5 Hz, 1H), 6.44 (t, J = 5.8 Hz, 1H), 6.59 (s, 1H), 6.73 (d, J = 8.4 Hz, 1H), 6.99 (d, J = 1.7

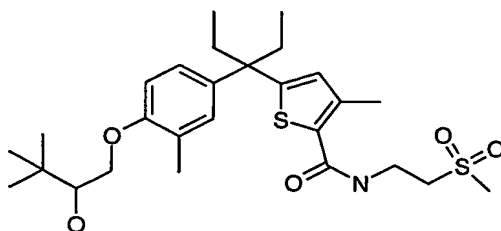
25

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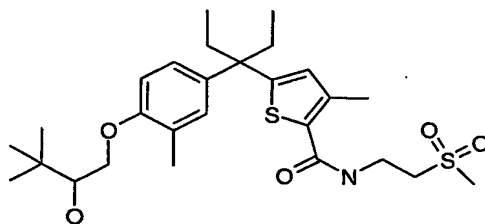
Hz, 1H), 7.03 (dd, $J = 8.7, 2.5$ Hz, 1H). LC/MS (m/z): calcd for $C_{27}H_{42}NO_5S_2$ ($M+H$)⁺: 524.8; found: 524.2.

Example 39 and Example 40

- 5 Preparation of enantiomers of 5-[1-ethyl-1-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]propyl]-3-methylthiophene-2-carboxylic acid (2-methylsulfonyl-ethyl) amide.



Enantiomer 1



Enantiomer 2

10

- A racemic mixture of 5-[1-ethyl-1-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]propyl]-3-methylthiophene-2-carboxylic acid (2-methylsulfonyl-ethyl) amide (247mg) is chromatographed (CHIRALPAK AD column, 40% *i*-PrOH/Hept) to give enantiomer 1, Example 39 (100 mg, 40 %) and enantiomer 2, Example 40 (80 mg, 32%).

Example 39, Enantiomer 1 :

rt = 6.0 m

- 20 NMR & LC/MS: Identical to the racemic material, Example 38.

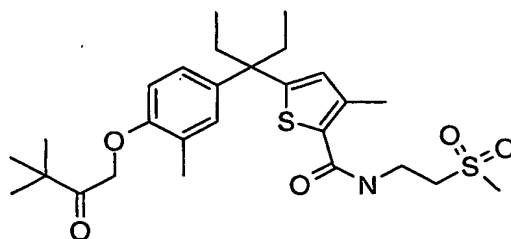
Example 40, Enantiomer 2 :

rt = 10.2 m

NMR & LC/MS: Identical to the racemic material, Example 38.

Example 41

Preparation of 5-{1-[4-(3,3-Dimethyl-2-oxo-butyoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carboxylic acid (2-methanesulfonyl-ethyl)-amide.



To a solution of 5-[1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methylphenyl]propyl]-3-methylthiophene-2-carboxylic acid (2-methylsulfonyl-ethyl) amide, Example 38 (0.1096 g, 0.21 mmol) in CH_2Cl_2 (10 mL) is added NMO (37 mg, 0.31 mmol), and TPAP (3.7 mg, 0.01 mmol). The resulting solution is stirred at RT for 5 m, then it is filtered through a silica gel column, and washed with excess amount of EtOAc. Concentration of the solvent resulted in the title compound (62 mg, 0.12 mmol, 57%).

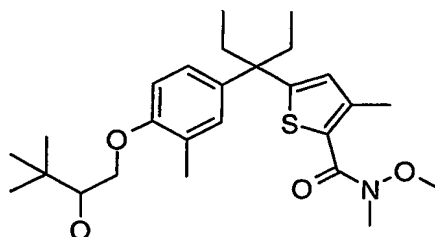
^1H NMR (CDCl_3), δ 0.70 (t, $J = 8.0$ Hz, 6H), 1.27 (s, 9H), 1.99 (m, 4H), 2.18 (s, 3H), 2.38 (s, 3H), 2.90 (s, 3H), 3.24 (t, $J = 6.0$ Hz, 2H), 3.82 (m, 2H), 6.36 (t, $J = 5.8$ Hz, 1H), 6.42 (d, $J = 8.4$ Hz, 1H), 6.50 (s, 1H), 6.85-6.95 (m, 2H).

LC/MS (m/z): 522.1 ($\text{M}+\text{H}$) $^+$.

Example 42

Preparation of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butyoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methoxy-methyl-amide.

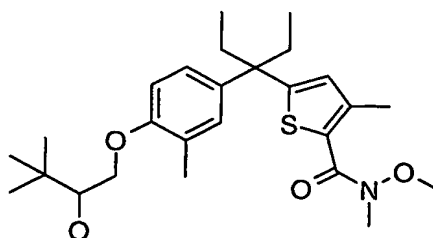
-196-



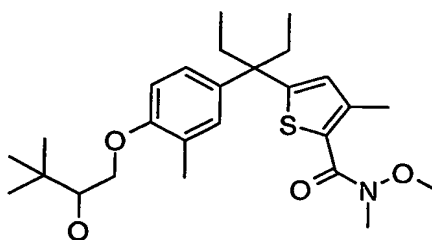
Using the procedure analogous to Example 38, from 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (0.34 g, 0.81 mmol) and *N*-methoxy-*N*-methylamine hydrochloride salt (0.087 g, 0.89 mmol) furnished the titled compound (0.2083 g, 0.45 mmol, 56%).
¹H NMR (CD₃OD), δ 0.65 (t, *J* = 7.4 Hz, 6H), 0.95 (s, 9H), 2.07 (q, *J* = 7.4 Hz, 4H), 2.14 (s, 3H), 2.35 (s, 3H), 3.25 (s, 3H), 3.57 (dd, *J* = 7.8, 2.9 Hz, 1H), 3.58 (s, 3H), 3.82 (dd, *J* = 9.7, 7.8 Hz, 1H), 4.07 (dd, *J* = 9.7, 2.9 Hz, 1H), 6.62 (s, 1H), 6.73 (d, *J* = 8.9 Hz, 1H), 6.94 (d, *J* = 2.4 Hz, 1H), 7.01 (dd, *J* = 8.9, 2.4 Hz, 1H). LC/MS (*m/z*): calcd for C₂₆H₄₀NO₄S (M+H)⁺: 462.2; found: 462.2.

Example 43 and Example 44

Preparation of enantiomers of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methoxy-methyl-amide.



Enantiomer 1



Enantiomer 2

A racemic mixture of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methoxy-methyl-amide (92 mg) is chromatographed (CHIRALPAK AD column, 40% *i*-PrOH/Hept) to give enantiomer 1, Example 43 (42 mg, 46 %) and enantiomer 2, Example 44 (34.5 mg, 38 %).

5

Example 43, Enantiomer 1 :

rt = 4.4 m

NMR & LC/MS: Identical to the racemic material, Example 42.

Example 44, Enantiomer 2 :

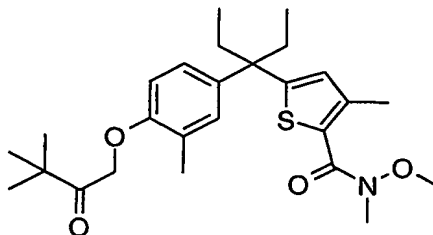
10 rt = 7.3 m

NMR & LC/MS: Identical to the racemic material, Example 42.

Example 45

Preparation of 5-{1-[4-(3,3-dimethyl-2-oxo-butyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carboxylic acid methoxy-methyl-amide.

15



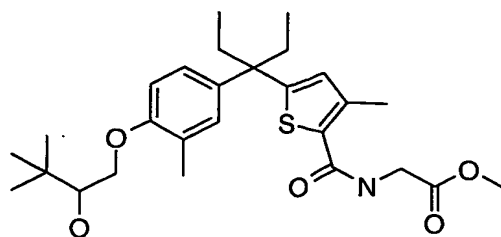
Using a procedure analogous to Example 41, from 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methoxy-methyl-amide (Example 42) (110 mg, 0.245 mmol) yielded the titled compound (107.9 mg, 98%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 6.4 Hz, 6H), 1.27 (s, 9H), 2.09 (q, *J* = 6.4 Hz, 4H), 2.27 (s, 3H), 2.48 (s, 3H), 3.30 (s, 3H), 3.67 (s, 3H), 4.85 (s, 2H), 6.52 (d, *J* = 8.6 Hz, 1H), 6.57 (s, 1H), 7.00 (d, *J* = 8.6 Hz, 1H), 7.02 (s, 1H). LC/MS (*m/z*): calcd for C₂₆H₃₈NO₄S (M+H)⁺: 460.2; found: 460.2.

25

Example 46

Preparation of 2-[5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid methyl ester.

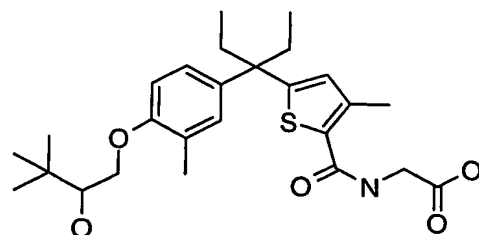
-198-



- 5 Using the procedure analogous to Example 38, from 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (0.4307 g, 1.03 mmol) and glycine methyl ester hydrochloride (0.129 g, 1.03 mmol) furnished the titled compound (0.2535 g, 50%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 6.8 Hz, 6H), 1.03 (s, 9H), 2.09 (q, *J* = 6.8 Hz, 4H), 2.21 (s, 3H), 2.44 (d, *J* = 2.5 Hz, 1H), 2.48 (s, 3H), 3.72 (dt, *J* = 8.3, 2.5 Hz, 1H), 3.78 (s, 3H), 3.87 (t, *J* = 8.8 Hz, 1H), 4.11 (dd, *J* = 9.2, 2.5 Hz, 1H), 4.17 (d, *J* = 5.4 Hz, 2H), 6.20 (s, 1H), 6.61 (s, 1H), 6.73 (d, *J* = 8.8 Hz, 1H), 6.99-7.01 (m, 1H), 7.04 (dd, *J* = 8.8, 2.4 Hz, 1H). LC/MS (*m/z*): 490.2 (M+H)⁺.
- 10

15 Example 47

Preparation of 2-[5-{1-Ethyl-1-{4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid.



20

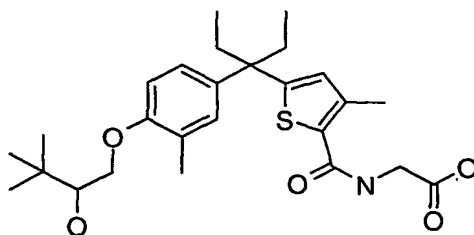
2-[5-{1-Ethyl-1-{4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid methyl ester (Example 46) (0.24 g, 0.49 mmol) is dissolved in THF (5 mL), treated with H₂O (1 mL) and LiOH (59 mg, 2.46 mmol) and the resulting mixture is stirred at RT overnight. The

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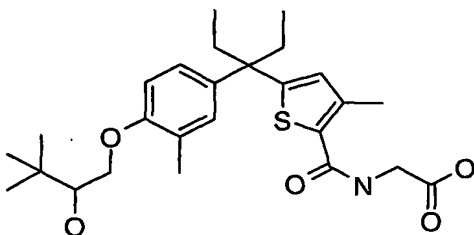
solution is diluted with H₂O (10 mL), the pH value is adjusted to *ca.* 3-4 using 1 M HCl, it is extracted with EtOAc (2 x 40 mL), dried with MgSO₄, filtered and concentrated to yield the titled compound (0.233 g, 0.49 mmol, 99%). ¹H NMR (CD₃OD), δ 0.75 (t, *J* = 7.4 Hz, 6H), 1.05 (s, 9H), 2.17 (q, *J* = 7.4 Hz, 4H), 2.23 (s, 3H), 2.48 (s, 3H), 3.66 (dd, *J* = 7.8 2.9 Hz, 1H), 3.91 (dd, *J* = 9.6, 7.8 Hz, 1H), 4.01 (s, 2H), 4.16 (dd, *J* = 9.6, 2.9 Hz, 1H), 6.74 (s, 1H), 6.84 (d, *J* = 8.8 Hz, 1H), 7.03-7.06 (m, 1H), 7.11 (dd, *J* = 8.2, 2.5 Hz, 1H). LC/MS (*m/z*): calcd for C₂₆H₃₈NO₅S (M+H)⁺: 476.2; found: 476.2.

Example 48 and Example 49

Preparation of enantiomers of 2-[5-{1-Ethyl-1-{4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid.



Enantiomer 1



Enantiomer 2

A racemic mixture of 2-[5-{1-Ethyl-1-{4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid, Example 47 (130 mg) is chromatographed (CHIRALPAK AD column, 20% *i*-PrOH/Hept, 0.2% TFA) to give enantiomer 1, Example 48 (47.9 mg, 37%) and enantiomer 2, Example 49 (39 mg, 30%).

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Example 48, Enantiomer 1 :

rt = 6.5 m

NMR & LC/MS: Identical to the racemic material, Example 47.

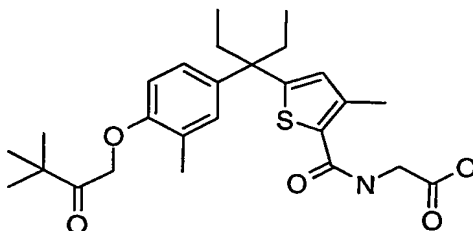
Example 49, Enantiomer 2 :

5 rt = 15.2 m

NMR & LC/MS: Identical to the racemic material, Example 47.

Example 50

10 Preparation of 2-[5-{ 1-[4-(3,3-Dimethyl-2-oxo-butyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid.



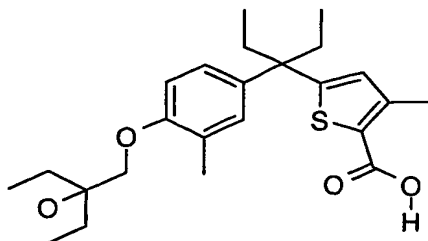
15 2-[5-{ 1-Ethyl-1-{ 4-(2-hydroxy-3,3-dimethyl-butyloxy)-3-methyl-phenyl-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid (Example 47) (99 mg, 0.21 mmol) is dissolved in CH₂Cl₂ (4 mL), treated with Dess-Martin reagent (97 mg, 0.23 mmol). The resulting mixture is stirred at RT 2h. It is diluted with EtOAc (25 mL), washed with 10% Na₂SO₃ (2 x 20 mL) along with 0.1 M HCl (20 mL); dried with MgSO₄, filtered and concentrated. Purification of the resulting crude product by flash chromatography, eluted with 15% CH₃OH/EtOAc with 0.5%HOAc yielded the

20 titled compound (56.2 mg, 0.11mmol, 53%). ¹H NMR (CD₃OD), δ 0.75 (t, J = 7.2 Hz, 6H), 1.29 (s, 9H), 2.19 (q, J = 7.2 Hz, 4H), 2.25 (s, 3H), 2.47 (s, 3H), 4.02 (s, 2H), 5.05 (s, 2H), 6.66 (d, J = 7.6 Hz, 1H), 6.74 (s, 1H), 7.00-7.11 (m, 2H), 7.96 (bs, 1H). LC/MS (m/z): calcd for C₂₆H₃₆NO₅S (M+H)⁺: 474.2; found: 474.2.

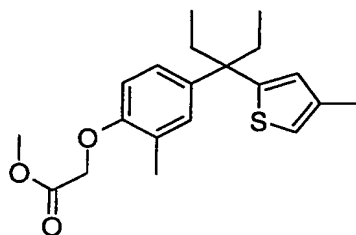
25 Example 51

Preparation of (5-{ 1-ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid.

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A. 2-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-acetic acid methyl ester.

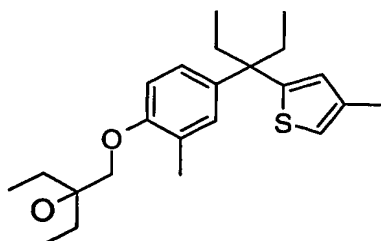


5

4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenol (10.66g, 38.9 mmol) is reacted with methyl bromoacetate (4.4 ml, 46.7 mmol) and K_2CO_3 (10.70 g, 77.81 mmol) in acetone (100 ml) at refluxing temperature overnight. The reaction is cooled to RT, filtered and washed with Et_2O and concentrated. The crude product is purified by chromatography to give the titled compound (12.15 g, 35.1 mmol, 90%). 1H NMR (CD_3Cl_3), δ 0.70 (t, $J = 7.2$ Hz, 6H), 2.04-2.12 (m, 4H), 2.21 (s, 3H), 2.26 (s, 3H), 3.81 (s, 3H), 4.63 (s, 2H), 6.57-6.61 (m, 2H), 6.69-6.71 (m, 1H), 7.02-7.06 (m, 2H). LC/MS (m/z): calcd for $C_{20}H_{27}O_3S$ ($M+H$) $^+$: 347.5; found: 347.1.

15

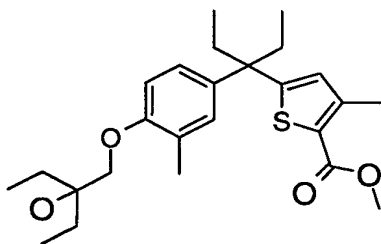
B. 3-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}methanol.



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{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy} acetic acid methyl ester (5.52 g, 15.95 mmol) is dissolved in THF (50 mL). The solution is cooled to 0 °C, and treated with Ethyl magnesiumbromide (3.0 M, 13.3 mL) in a dropwise fashion. The reaction is stirred at 0 °C for 10 m, and refluxed for 3 h. It is cooled to 0 °C, quenched with sat. NH₄Cl (50 mL), then 1.0 M HCl (30 mL) is added. It is extracted with EtOAc (2 x 100 mL), dried and concentrated. The crude product is purified by chromatography to give the titled compound (5.22 g, 13.96 mmol, 87%).
¹H NMR (CD₃Cl₃), δ 0.71 (t, *J* = 7.4 Hz, 6H), 0.95 (t, *J* = 7.1 Hz, 6H), 1.62-1.73 (m, 4H), 2.04-2.14 (m, 4H), 2.21 (s, 6H), 3.81 (s, 2H), 6.59-6.61 (m, 1H), 6.69-6.74 (m, 2H), 7.02-7.08 (m, 2H). LC/MS (*m/z*): calcd for C₂₃H₃₅O₂S (M+H)⁺: 375.6; found: 375.3.

C. 5-{1-Ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methyl ester.

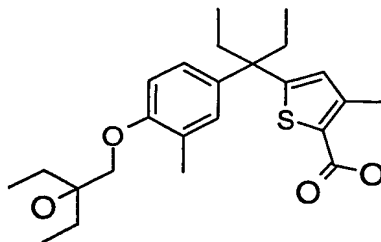


3-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}methyl-pentan-3-ol, Example 51B (0.50g, 1.34 mmol) is dissolved in THF (10 mL). The solution is cooled to 0 °C, treated with *n*BuLi (1.6 M, 1.8 mL, 2.95 mmol). It is stirred at 0 °C for 20 min, and methyl chloroformate (113 µL, 1.47 mmol) is added. The reaction is stirred at 0 °C for 10 min and RT for 20 m before it is quenched with satd NH₄Cl (5 mL). It is diluted with H₂O (10 mL), treated with 0.1 M HCl (10 mL) and extracted with EtOAc (3 x 15 mL), dried and concentrated. The crude product is purified by chromatography to give the titled compound (0.24 g, 0.56 mmol, 41%).
¹H NMR (CD₃Cl₃), δ 0.71 (t, *J* = 7.1 Hz, 6H), 0.95 (t, *J* = 7.9 Hz, 6H), 1.64-1.72 (m, 4H), 2.11 (q, *J* = 7.1 Hz, 4H), 2.21 (s, 3H), 2.49 (s, 3H), 3.81 (s, 3H), 6.61 (s, 1H),

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6.72 (d, $J = 8.4$ Hz, 1H), 6.85-7.01 (m, 2H). LC/MS (m/z): calcd for $C_{25}H_{40}NO_4S$ ($M+NH_4$) $^+$: 450.3; found: 450.3.

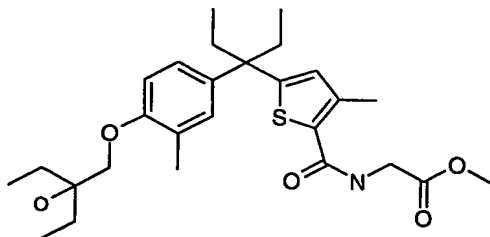
5 D. 5-{1-Ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid.



10 Using a procedure analogous to Example 47, 5-{1-Ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methyl ester (0.23 g, 0.53 mmol) gives the title compound (0.20 g, 0.48 mmol, 91%).
 1H NMR (CD_3Cl_3), δ 0.72 (t, $J = 7.6$ Hz, 6H), 0.95 (t, $J = 7.1$ Hz, 6H), 1.64-1.72 (m, 4H), 2.11 (q, $J = 7.6$ Hz, 4H), 2.22 (s, 3H), 2.49 (s, 3H), 3.82 (s, 3H), 6.62 (s, 1H), 6.73 (d, $J = 8.3$ Hz, 1H), 6.99-7.06 (m, 2H). LC/MS (m/z): calcd for $C_{24}H_{33}O_4S$ ($M-H$) $^+$: 417.6; found: 417.2.

Example 52

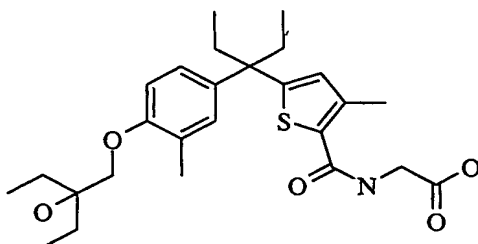
20 Preparation of 2-[(5-{1-Ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid methyl ester.



Using a procedure analogous to Example 38, 5-{1-Ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 51) (0.3 g, 0.72 mmol), glycine methyl ester hydrochloride, and DMF (2 mL) as reaction solvent to give the title compound (0.34 g, 0.69 mmol, 97%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.1 Hz, 6H), 0.95 (t, *J* = 7.1 Hz, 6H), 1.63-1.72 (m, 4H), 2.04-2.14 (m, 4H), 2.21 (s, 3H), 2.48 (s, 3H), 3.78 (s, 3H), 3.81 (s, 3H), 4.15 (d, *J* = 5.2 Hz, 2H), 6.20 (t, *J* = 5.2 Hz, 1H), 6.63 (s, 1H), 6.72 (d, *J* = 8.4 Hz, 1H), 6.98-7.01 (m, 1H), 7.01-7.06 (m, 1H). LC/MS (*m/z*): calcd. for C₂₇H₃₈NO₅S (M-H)⁻: 488.7; found: 488.5.

10 Example 53

Preparation of 2-[(5-{1-Ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid.

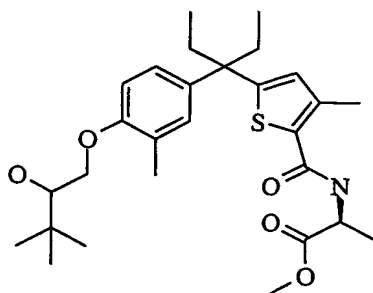


2-[(5-{1-Ethyl-1-[4-(2-ethyl-2-hydroxy-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid methyl ester (Example 52) (0.34 g, 0.69 mmol) is dissolved in MeOH (2 mL), treated with H₂O (0.5 mL) and NaOH (0.14 g, 3.47 mmol) and the resulting mixture is heated at a reflux for two hours cooled to at ambient temperature and stirred overnight. The solution is diluted with H₂O (10 mL), the pH value is adjusted to about 3-4 using 1 M HCl, it is extracted with EtOAc (40 mL). The EtOAc layer is washed with brine (20 mL), dried with MgSO₄, filtered and concentrated to yield the titled compound (0.244 g, 0.51 mmol, 74%). ¹H NMR (CD₃OD), δ 0.72 (t, *J* = 7.4 Hz, 6H), 0.94 (t, *J* = 7.4 Hz, 6H), 1.64-1.74 (m, 4H), 2.03-2.20 (m, 4H), 2.18 (s, 3H), 2.44 (s, 3H), 3.79 (s, 2H), 3.97-3.99 (m, 2H), 6.71 (s, 1H), 6.79 (d, *J* = 8.2 Hz, 1H), 6.99-7.02 (m, 1H), 7.06-7.10 (m, 1H), 7.88-7.94 (t, *J* = 5.7 Hz, 1H). LC/MS (*m/z*): calcd. for C₂₆H₃₆NO₅S (M-H)⁻: 475.6; found: 474.3

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Example 54

Preparation of epimer 2 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)amino]propionic acid methyl ester.

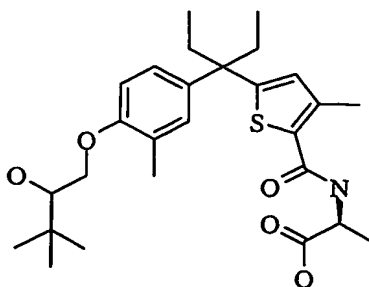
*L*-Epimer-2

Using a procedure analogous to Example 52, enantiomer 2 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 8) (0.50 g, 1.2 mmol) and *L*-alanine methyl ester

- 10 hydrochloride salt (0.18 g, 1.3 mmol) to give the titled compound (0.44 g, 0.87 mmol, 73%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.2 Hz, 6H), 1.02 (s, 9H), 1.47 (d, *J* = 7.2 Hz, 3H), 2.04-2.14 (m, 4H), 2.21 (s, 3H), 2.47 (s, 3H), 3.71 (dd, *J* = 8.6, 2.5 Hz, 1H), 3.77 (s, 3H), 3.88 (t, *J* = 8.6 Hz, 1H), 4.10 (dd, *J* = 9.2, 2.5 Hz, 1H), 4.67-4.75 (m, 1H), 6.26 (d, *J* = 7.1 Hz, 1H), 6.60 (s, 1H), 6.73 (d, *J* = 7.6 Hz, 1H), 6.97-7.06 (m, 2H).
- 15 LC/MS (*m/z*): calcd. for C₂₈H₄₂NO₅S (M+H)⁺: 504.7; found: 504.4.

Example 55

Preparation of epimer 2 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid.

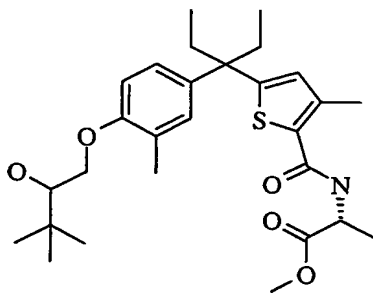
*L*-Epimer 2

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Using a procedure analogous to Example 53, epimer 2 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid methyl ester (0.42g, 1.0mmol) gives the title compound (0.37 g, 0.76 mmol, 73%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.4 Hz, 6H), 1.02 (s, 9H), 1.51 (d, *J* = 7.7 Hz, 3H), 2.04-2.14 (m, 4H), 2.20 (s, 3H), 2.47 (s, 3H), 3.72 (dd, *J* = 8.7, 2.5 Hz, 1H), 3.87 (t, *J* = 8.7, 1H), 4.10 (dd, *J* = 9.3, 2.8 Hz, 1H), 4.64-4.72 (m, 1H), 6.22 (d, *J* = 7.4, 1H), 6.62 (s, 1H), 6.73 (d, *J* = 8.4 Hz, 1H), 6.97-7.06 (m, 2H). LC/MS (*m/z*): calcd. for C₂₇H₄₀NO₅S (M+H)⁺: 490.7; found: 490.4.

10 Example 56

Preparation of epimer 2 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid methyl ester.



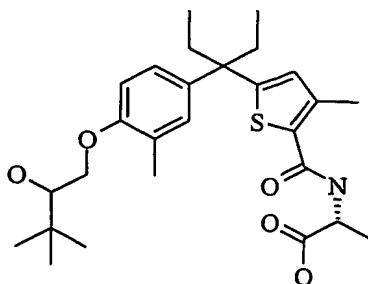
15 *D*-Epimer 2

Using a procedure analogous to Example 52, enantiomer 2 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 8) (0.40 g, 0.96 mmol) and *D*-alanine methyl ester hydrochloride salt (0.15 g, 1.05 mmol) to give the title compound (0.48 g, 0.95 mmol, 71%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.5 Hz, 6H), 1.02 (s, 9H), 1.47 (d, *J* = 7.0 Hz, 3H), 2.04-2.15 (m, 4H), 2.21 (s, 3H), 2.47 (s, 3H), 3.71 (d, *J* = 8.6 Hz, 1H), 3.77 (s, 3H), 3.87 (t, *J* = 9.2, 1H), 4.10 (dd, *J* = 9.1, 2.7 Hz, 1H), 4.66-4.76 (m, 1H), 6.26 (d, *J* = 7.6, 1H), 6.60 (s, 1H), 6.73 (d, *J* = 8.6 Hz, 1H), 6.98-7.07 (m, 2H). LC/MS (*m/z*): calcd. for C₂₈H₄₂NO₅S (M+H)⁺: 504.7; found: 504.4.

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Example 57

Preparation of epimer 2 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid.



5

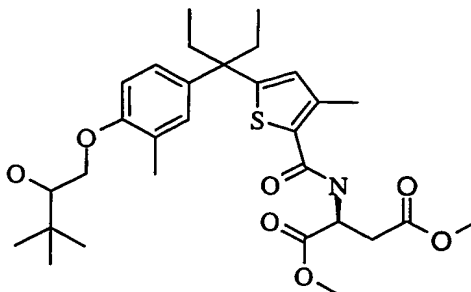
D-Epimer 2

Using a procedure analogous to Example 53, epimer 2 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid methyl ester (0.34g, 0.68 mmol) gives the title compound (0.33 g, 0.66 mmol, 79%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.5 Hz, 6H), 1.02 (s, 9H), 1.52 (d, *J* = 7.1 Hz, 3H), 2.04-2.14 (m, 4H), 2.21 (s, 3H), 2.47 (s, 3H), 3.71 (dd, *J* = 8.8, 2.7 Hz, 1H), 3.88 (t, *J* = 8.8, 1H), 4.10 (dd, *J* = 9.2, 2.7 Hz, 1H), 4.64-4.73 (m, 1H), 6.21 (d, *J* = 6.9, 1H), 6.62 (s, 1H), 6.73 (d, *J* = 8.6 Hz, 1H), 6.98-7.06 (m, 2H). LC/MS (*m/z*): calcd. for C₂₇H₄₀NO₅S (*M*+H)⁺: 490.7; found: 490.2.

10

15 Example 58

Preparation of *L*-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-succinic acid dimethyl ester.

*L*-Epimer 2

20

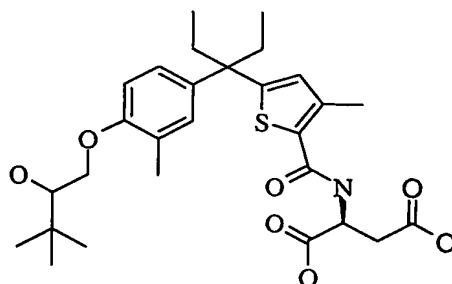
Using a procedure analogous to Example 52, enantiomer 2 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-

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carboxylic acid (Example 8) (0.4 g, 0.96 mmol) and *L*-aspartic acid dimethyl ester hydrochloride salt (0.21 g, 1.05 mmol) to give the title compound (0.42 g, 0.758 mmol, 78%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.7 Hz, 6H), 1.02 (s, 9H), 2.04-2.14 (m, 4H), 2.20 (s, 3H), 2.47 (s, 3H), 2.93 (dd, *J* = 17.2, 4.5 Hz, 1H), 3.10 (dd, *J* = 17.2, 4.3 Hz, 1H), 3.69-3.73 (m, 4H), 3.78 (s, 3H), 3.87 (t, *J* = 9.1, 1H), 4.10 (dd, *J* = 9.1, 2.6, 1H), 4.96-5.01 (m, 1H), 6.58 (s, 1H), 6.72 (d, *J* = 7.7, 1H), 6.78 (d, *J* = 7.8, 1H), 7.00 (d, *J* = 1.7, 1H), 7.04 (dd, *J* = 2.7, 8.5, 1H). LC/MS (*m/z*): calcd. for C₃₀H₄₄NO₇S (M+H)⁺: 562.7; found: 562.4.

10 Example 59

Preparation of epimer 2 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-succinic acid.



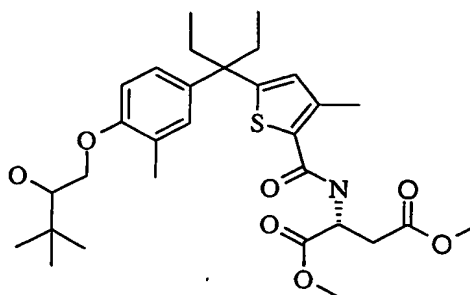
L-Epimer 2

Using a procedure analogous to Example 53, *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-succinic acid dimethyl ester, gives to the title compound (0.29 g, 0.54 mmol, 78%). ¹H NMR (CDCl₃), δ 0.70 (t, *J* = 7.4 Hz, 6H), 1.01 (s, 9H), 2.04-2.14 (m, 4H), 2.19 (s, 3H), 2.45 (s, 3H), 2.89-3.01 (m, 1H), 3.09-3.19 (m, 1H), 3.72 (d, *J* = 8.0 Hz, 1H), 3.87 (t, *J* = 8.8 Hz, 1H), 4.09 (d, *J* = 8.2 Hz, 1H), 4.98-5.05 (m, 1H), 6.60 (s, 1H), 6.71 (d, *J* = 8.8 Hz, 1H), 6.78 (d, *J* = 7.9 Hz, 1H), 6.98-7.05 (m, 2H), 7.30-7.60 (bs, 2H). LC/MS (*m/z*): calcd. for C₂₈H₄₀NO₇S (M+H)⁺: 534.7; found: 534.4.

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Example 60

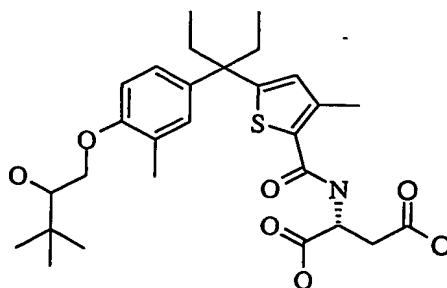
Preparation of epimer 2 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-succinic acid dimethyl ester.

*D*-Epimer 2

Using a procedure analogous to Example 52, enantiomer 2 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 8) (0.4 g, 0.96 mmol) and *D*-aspartic acid dimethyl ester hydrochloride salt (0.21 g, 1.05 mmol) to give the title compound (0.42 g, 0.75 mmol, 78%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.4 Hz, 6H), 1.02 (s, 9H), 2.04-2.14 (m, 4H), 2.21 (s, 3H), 2.47 (s, 3H), 2.94 (dd, *J* = 17.0, 4.6 Hz, 1H), 3.10 (dd, *J* = 17.0, 4.6 Hz, 1H), 3.69-3.74 (m, 4H), 3.78 (s, 3H), 3.87 (t, *J* = 9.1 Hz, 1H), 4.10 (dd, *J* = 9.1, 3.0 Hz, 1H), 4.96-5.02 (m, 1H), 6.59 (s, 1H), 6.73 (d, *J* = 8.4 Hz, 1H), 6.78 (d, *J* = 7.2 Hz, 1H), 7.00 (d, *J* = 2.3 Hz, 1H), 7.04 (dd, *J* = 2.7, 8.4 Hz, 1H). LC/MS (*m/z*): calcd. for C₃₀H₄₄NO₇S (*M*+H)⁺: 562.7; found: 562.4.

Example 61:

Preparation of epimer 2 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-succinic acid.



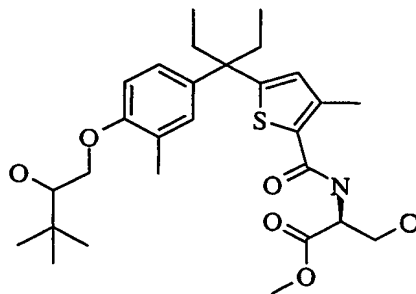
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D-Epimer 2

Using the procedure analogous to Example 53, epimer 2 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-succinic acid dimethyl ester (0.40g, 0.71 mmol) gives the titled compound (0.30 g, 0.56 mmol, 79%). ¹H NMR (CDCl₃), δ 0.70 (t, *J* = 7.4 Hz, 6H), 1.01 (s, 9H), 2.04-2.14 (m, 4H), 2.19 (s, 3H), 2.45 (s, 3H), 2.89-3.01 (m, 1H), 3.09-3.19 (m, 1H), 3.72 (d, *J* = 8.0 Hz, 1H), 3.87 (t, *J* = 8.8 Hz, 1H), 4.09 (d, *J* = 8.2 Hz, 1H), 4.98-5.05 (m, 1H), 6.60 (s, 1H), 6.71 (d, *J* = 8.8 Hz, 1H), 6.78 (d, *J* = 7.9 Hz, 1H), 6.98-7.05 (m, 2H), 7.30-7.60 (bs, 2H). LC/MS (*m/z*): calcd. for C₂₈H₄₀NO₇S (M+H)⁺: 534.7; found: 534.4.

Example 62:

Preparation of epimer 2 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-hydroxy-propionic acid methyl ester.

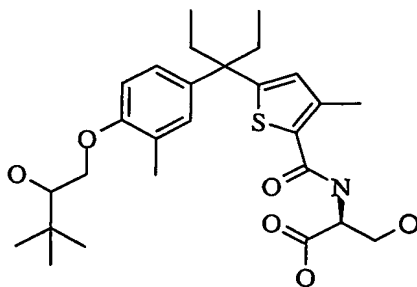
*L*-Epimer 2

Using a procedure analogous to Example 52, enantiomer 2 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 8) (0.4 g, 0.96 mmol) and *L*-serine methyl ester hydrochloride salt (0.16 g, 1.05 mmol) to give the title compound (0.41 g, 0.79 mmol, 82%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.7 Hz, 6H), 1.02 (s, 9H), 2.04-2.14 (m, 4H), 2.21 (s, 3H), 2.49 (s, 3H), 3.71 (dd, *J* = 8.6, 2.6 Hz, 2H), 3.81 (s, 3H), 3.87 (t, *J* = 8.7 Hz, 1H), 4.01 (d, *J* = 3.5 Hz, 2H), 4.09 (dd, *J* = 5.0, 2.7 Hz, 1H), 4.77-4.81 (m, 1H), 6.61 (s, 1H), 6.65 (d, *J* = 6.6 Hz, 1H), 6.73 (d, *J* = 8.9 Hz, 1H), 6.99 (d, *J* = 1.8 Hz, 1H), 7.04 (dd, *J* = 8.9, 2.6 Hz, 1H). LC/MS (*m/z*): calcd. for C₂₈H₄₂NO₆S (M+H)⁺: 520.7; found: 520.2.

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Example 63:

Preparation of epimer 2 of *L*-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-hydroxy-propionic acid.

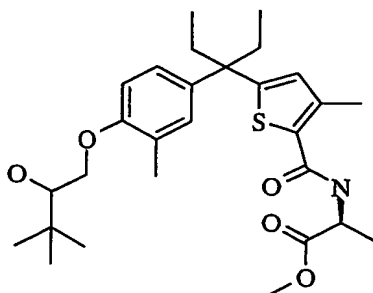
*L*-Epimer 2

Using a procedure analogous to Example 53, epimer 2 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-hydroxy-propionic acid methyl ester (0.40g, 0.77 mmol) gives the titled compound (0.33 g, 0.66 mmol, 85%). ¹H NMR (CDCl₃) δ 0.69 (t, *J* = 7.2 Hz, 6H), 1.01 (s, 9H), 2.00-2.14 (m, 4H), 2.18 (s, 3H), 2.44 (s, 3H), 3.50 (dd, *J* = 13.9, 6.8 Hz, 1H), 3.71 (d, *J* = 8.0 Hz, 1H), 3.88 (t, *J* = 8.6 Hz, 1H), 4.02 (d, *J* = 9.2 Hz, 1H), 4.06-4.12 (m, 1H), 4.62-4.71 (m, 1H), 5.53 (bs, 2H), 6.60 (s, 1H), 6.70 (d, *J* = 8.7 Hz, 1H), 6.79 (d, *J* = 6.6 Hz, 1H), 6.95-7.05 (m, 2H). LC/MS (*m/z*): calcd. for C₂₇H₄₀NO₆S (M+H)⁺: 506.7; found: 506.2.

Example 64:

Preparation of epimer 1 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid methyl ester.

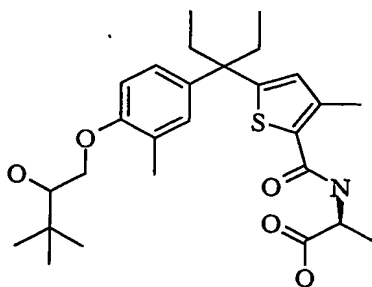
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*L*-Epimer 1

Using a procedure analogous to Example 52, enantiomer 1 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 1) (0.50 g, 1.19 mmol) and *L*-alanine methyl ester hydrochloride salt (0.18 g, 1.31 mmol) to give the title compound (0.3 g, 0.60 mmol, 50%). ¹H NMR and LC/MS: identical to (*D*-epimer-2), Example 56.

Example 65:

- Preparation of epimer 1 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid.

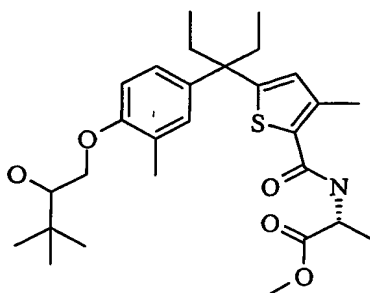
*L*-Epimer 1

- Using a procedure analogous to 53, epimer 1 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid methyl ester (0.3g, 0.60 mmol) gives the title compound (0.27 g, 0.55 mmol, 93%). ¹H NMR and LC/MS: identical to (*D*-epimer-2), Example 57.

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Example 66

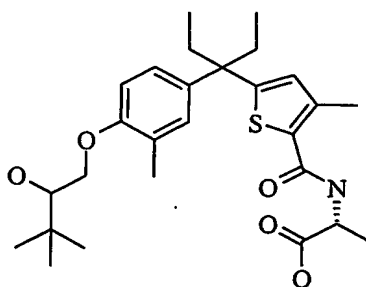
Preparation of epimer 1 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid methyl ester.

*D*-Epimer 1

Using a procedure analogous to Example 52, enantiomer 1 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 7) (0.5 g, 1.19 mmol) and *D*-alanine methyl ester hydrochloride salt (0.18 g, 1.31 mmol) to give the title compound (0.4 g, 0.79 mmol, 66%). ¹H NMR and LC/MS: identical to 2133006 (*L*-Epimer-2), Example 54.

Example 67

Preparation of epimer 1 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-propionic acid.

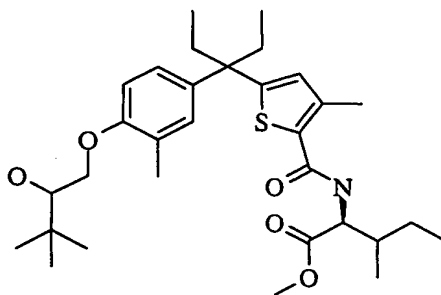
*D*-Epimer 1

Using a procedure analogous to Example 53, epimer 1 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-

carbonyl)-amino]-propionic acid methyl ester (0.4 g, 0.79 mmol) gives the title compound (0.33 g, 0.67 mmol, 85%). ¹H NMR and LC/MS: identical to (*L*-epimer-2), Example 55.

Example 68:

- 5 Preparation of epimer 1 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-pentanoic acid methyl ester.



L-Epimer 1

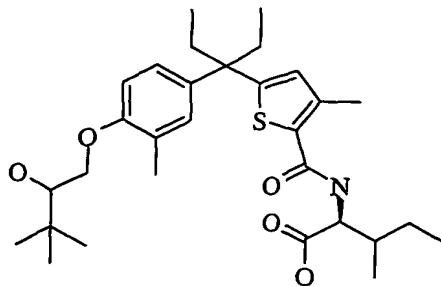
10

- Using a procedure analogous to Example 52, enantiomer 1 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 7) (0.20 g, 0.48 mmol) and *L*-isoleucine methyl ester hydrochloride salt (0.095 g, 0.53 mmol) to give the title compound (0.20 g, 0.37 mmol, 76%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.4 Hz, 6H), 0.91-0.98 (m, 6H), 1.02 (s, 9H), 1.16-1.29 (m, 1H), 1.43-1.55 (m, 1H), 1.90-2.00 (m, 1H), 2.02-2.16 (m, 4H), 2.21 (s, 3H), 2.49 (s, 3H), 3.71 (dd, *J* = 8.7, 2.6 Hz, 1H), 3.74 (s, 3H), 3.87 (t, *J* = 8.7 Hz, 1H), 4.10 (dd, *J* = 9.2, 2.6 Hz, 1H), 4.74 (dd, *J* = 8.4, 4.9 Hz, 1H), 6.21 (d, *J* = 8.4, 1H), 6.59 (s, 1H), 6.73 (d, *J* = 8.8 Hz, 1H), 7.00 (d, *J* = 2.3 Hz, 1H), 7.04 (dd, *J* = 8.6, 2.3 Hz, 1H).
- 15 LC/MS (*m/z*): calcd. for C₃₁H₄₈NO₅S (M+H)⁺: 546.8; found: 546.2.
- 20

Example 69

Preparation of epimer 1 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-pentanoic acid.

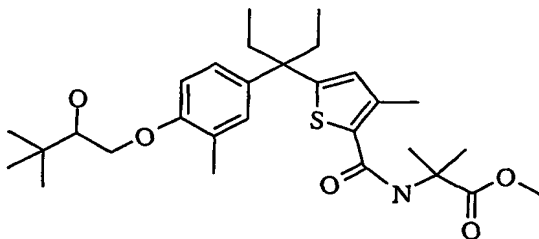
-215-

*L*-Epimer 1

Using a procedure analogous to Example 53, epimer 1 of *L*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-pentanoic acid methyl ester (0.2g, 0.37 mmol) gives the title compound (0.16 g, 0.30 mmol, 84%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.5 Hz, 6H), 0.94-1.02 (m, 6H), 1.03 (s, 9H), 1.21-1.32 (m, 1H), 1.48-1.62 (m, 1H), 1.98-2.16 (m, 5H), 2.21 (s, 3H), 2.47 (s, 3H), 3.72 (dd, *J* = 8.5, 2.6 Hz, 1H), 3.88 (t, *J* = 8.5 Hz, 1H), 4.10 (dd, *J* = 9.3, 2.7 Hz, 1H), 4.73 (dd, *J* = 7.8, 4.8 Hz, 1H), 6.18 (d, *J* = 8.7, 1H), 6.60 (s, 1H), 6.73 (d, *J* = 8.4 Hz, 1H), 7.00 (d, *J* = 2.2 Hz, 1H), 7.04 (dd, *J* = 8.4, 2.2 Hz, 1H). LC/MS (*m/z*): calcd. for C₃₀H₄₆NO₅S (M+H)⁺: 531.8; found: 532.1.

Example 70

Preparation of enantiomer 1 of 2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester.



Enantiomer 1

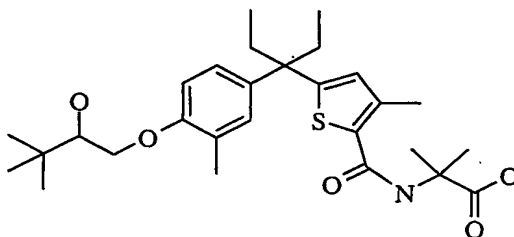
Using the procedure analogous to Example 52, enantiomer 1 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 7) (0.2 g, 0.48 mmol) and 2-amino-2-methyl-propionic acid

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methyl ester hydrochloride salt (0.018 g, 0.53 mmol) to give the title compound (0.20 g, 0.39 mmol, 71%). ^1H NMR (CDCl_3), δ 0.69 (t, $J = 7.0$ Hz, 6H), 1.01 (s, 9H), 1.60 (s, 6H), 2.02-2.13 (m, 4H), 2.19 (s, 3H), 2.44 (s, 3H), 3.70 (dd, $J = 8.9, 2.6$ Hz, 1H), 3.76 (s, 3H), 3.86 (t, $J = 8.7$, 1H), 4.09 (dd, $J = 9.4, 2.6$ Hz, 1H), 6.28 (s, 1H), 6.59 (s, 1H), 6.73 (d, $J = 8.4$ Hz, 1H), 6.99 (d, $J = 2.2$ Hz, 1H), 7.04 (dd, $J = 8.4, 2.2$ Hz, 1H). LC/MS (m/z): calcd. for $\text{C}_{29}\text{H}_{44}\text{NO}_5\text{S}$ ($\text{M}+\text{H}$) $^+$: 518.7; found: 518.2.

Example 71

Preparation of enantiomer 1 of 2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid.



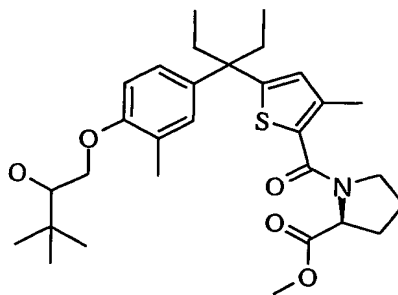
Enantiomer 1

Using a procedure analogous to Example 53, enantiomer 1 of 2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester (0.20 g, 0.39 mmol) gives the title compound (0.17 g, 0.34 mmol, 84%). ^1H NMR (CDCl_3), δ 0.71 (t, $J = 7.5$ Hz, 6H), 1.02 (s, 9H), 1.65 (s, 6H), 2.03-2.14 (m, 4H), 2.21 (s, 3H), 2.47 (s, 3H), 3.71 (dd, $J = 8.6, 2.5$ Hz, 1H), 3.87 (t, $J = 8.6$, 1H), 4.09 (dd, $J = 9.2, 2.5$ Hz, 1H), 6.11 (s, 1H), 6.63 (s, 1H), 6.73 (d, $J = 8.3$ Hz, 1H), 6.73 (d, $J = 8.4$ Hz, 1H), 6.98 (d, $J = 2.2$ Hz, 1H), 7.04 (dd, $J = 8.4, 2.2$ Hz, 1H). LC/MS (m/z): calcd. for $\text{C}_{28}\text{H}_{42}\text{NO}_5\text{S}$ ($\text{M}+\text{H}$) $^+$: 504.7; found: 504.2.

Example 72

Preparation of epimer 1 of *L*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)pyrrolidine-2-carboxylic acid methyl ester.

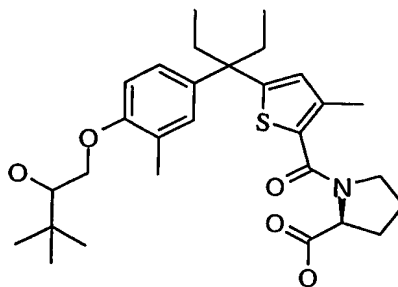
-217-

*L*-Epimer 1

Using a procedure analogous to Example 52, enantiomer 1 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 7) (0.20 g, 0.4778 mmol) and *L*-proline methyl ester hydrochloride salt (0.09 g, 0.53 mmol) to give the title compound (0.14 g, 0.26 mmol, 56%). ¹H NMR (CDCl₃), δ 0.69 (t, *J* = 7.4 Hz, 3H), 0.70 (t, *J* = 7.1 Hz, 3H), 1.00 (s, 9H), 1.85-2.14 (m, 7H), 2.19 (s, 3H), 2.21-2.36 (m, 4H), 3.60-3.78 (m, 6H), 3.86 (t, *J* = 9.3, 1H), 4.09 (dd, *J* = 9.3, 2.8 Hz, 1H), , 4.53-4.65 (m, 1 H), 6.53 (s, 1H), 6.71 (d, *J* = 8.9 Hz, 1H), 6.96-7.06 (m, 2H). LC/MS (*m/z*): calcd. for C₃₀H₄₄NO₅S (M+H)⁺: 530.8; found: 530.2.

Example 73

Preparation of epimer 1 of *L*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxyl)pyrrolidine-2-carboxylic acid.

*L*-Enantiomer 1

Using a procedure analogous to Example 53, epimer 1 of *L*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxyl)pyrrolidine-2-carboxylic acid methyl ester (0.20g, 0.39 mmol) gives the title compound (0.17 g, 0.34 mmol, 84%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.5 Hz, 6H),

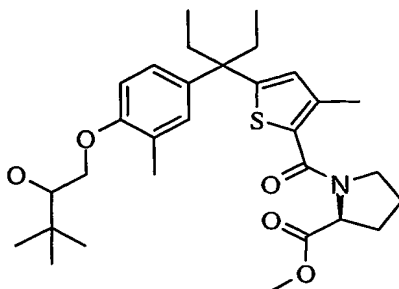
-218-

1.02 (s, 9H), 1.91-2.15 (m, 8H), 2.20 (s, 3H), 2.36 (s, 3H), 2.42 (bs, 1H), 3.63-3.76 (m, 3H), 3.87 (t, $J = 9.2$, 1H), 4.09 (dd, $J = 9.2$, 2.6 Hz, 1H), 4.68-4.75 (m, 1H), 6.60 (s, 1H), 6.72 (d, $J = 8.3$ Hz, 1H), 6.99 (d, $J = 2.2$ Hz, 1H), 7.03 (dd, $J = 8.3$, 2.2 Hz, 1H). LC/MS (m/z): calcd. for $C_{29}H_{42}NO_5S$ ($M+H$)⁺: 516.7; found: 516.2.

5

Example 74

Preparation of epimer 2 of *L*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid methyl ester.



10

L-Epimer 2

Using the procedure analogous to Example 52, enantiomer 2 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 8) (0.50 g, 1.19 mmol) and *L*-proline methyl ester hydrochloride salt (0.22 g, 1.3 mmol) to give the title compound (0.31 g, 0.59 mmol, 49%). ¹H NMR (CDCl₃), δ 0.70 (t, $J = 7.1$ Hz, 3H), 0.71 (t, $J = 7.5$ Hz, 1H), 1.02 (s, 9H), 1.87-2.15 (m, 7H), 2.20 (s, 3H), 2.22-2.38 (m, 4H), 3.60-3.78 (m, 6H), 3.87 (t, $J = 9.3$, 1H), 4.09 (dd, $J = 9.3$, 2.7 Hz, 1H), 4.53-4.65 (m, 1H), 6.54 (s, 1H), 6.71 (d, $J = 8.9$ Hz, 1H), 6.96-7.06 (m, 2H). LC/MS (m/z): calcd. for $C_{30}H_{44}NO_5S$ ($M+H$)⁺: 530.8; found: 530.2.

15

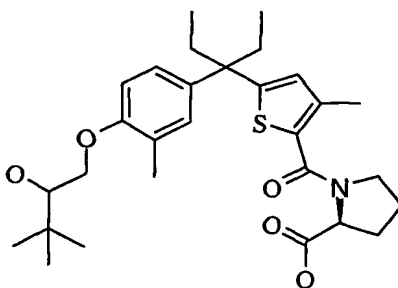
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Example 75

Preparation of epimer 2 of *L*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid.

25

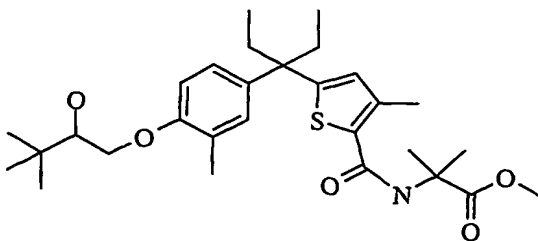
-219-

*L*-Epimer 2

Using the procedure analogous to Example 53, epimer 2 of 2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester, (0.31g, 0.59 mmol) gives the title compound (0.29 g, 0.56 mmol, 97%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.5 Hz, 6H), 1.02 (s, 9H), 1.92-2.15 (m, 8H), 2.20 (s, 3H), 2.36 (s, 3H), 2.41 (bs, 1H), 3.63-3.76 (m, 3H), 3.90 (t, *J* = 8.9, 1H), 4.10 (dd, *J* = 8.9, 2.5 Hz, 1H), 4.68-4.75 (m, 1H), 6.60 (s, 1H), 6.72 (d, *J* = 8.5 Hz, 1H), 6.99 (d, *J* = 2.3 Hz, 1H), 7.03 (dd, *J* = 8.5, 2.3 Hz, 1H). LC/MS (*m/z*): calcd. for C₂₉H₄₂NO₅S (M+H)⁺: 516.7; found: 516.3.

Example 76

Preparation of enantiomer 2 of 2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester.



Enantiomer 2

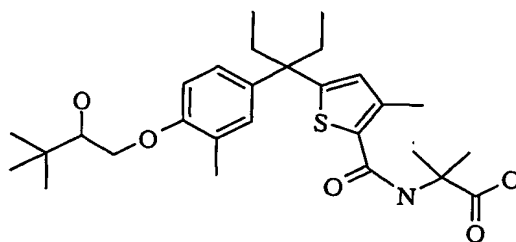
Using the procedure analogous to Example 52, enantiomer 2 of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 8) (0.5 g, 1.19 mmol) and 2-amino-2-methyl-propionic acid

-220-

methyl ester hydrochloride salt (0.2 g, 1.31 mmol) to give the title compound (0.44 g, 0.85 mmol, 71%). ¹H NMR and LC/MS: identical to (enantiomer-1), Example 70.

Example 77

- 5 Preparation of enantiomer of 2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid.



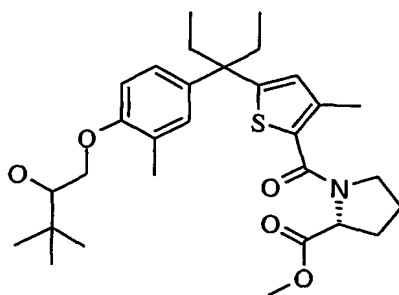
Enantiomer 2

- 10 Using the procedure analogous to Example 53, enantiomer 2 of 2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester (0.44g, 0.85 mmol) gives the title compound (0.35 g, 0.69 mmol, 81%). ¹H NMR and LC/MS: identical to (enantiomer-1), Example 71.

15

Example 78

Preparation of *D*-1-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid methyl ester

*D*-Racemic

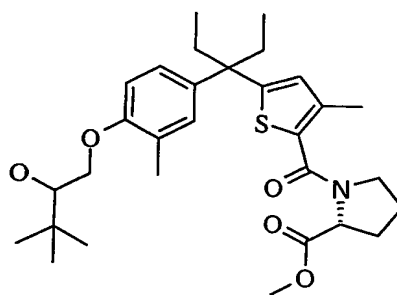
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-221-

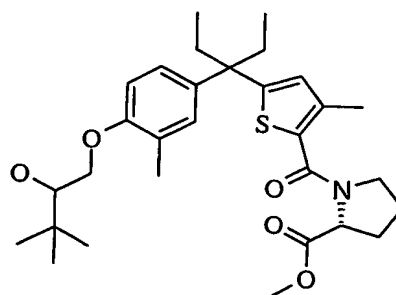
Using a procedure analogous to Example 52, a racemic mixture of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (0.6 g, 1.39 mmol) and *D*-proline methyl ester hydrochloride salt (0.28 g, 1.53 mmol) give the title compound (0.54 g, 1.02 mmol, 73%). ¹H NMR (CDCl₃), δ 0.70 (t, *J* = 7.1 Hz, 3H), 0.71 (t, *J* = 7.5 Hz, 3H) 1.02 (s, 9H), 1.88-2.16 (m, 7H), 2.20 (s, 3H), 2.22-2.38 (m, 4H), 3.61-3.79 (m, 6H), 3.87 (t, *J* = 8.8, 1H), 4.09 (dd, *J* = 9.1, 2.6 Hz, 1H), 4.56-4.65 (m, 1 H), 6.54 (s, 1H), 6.71 (d, *J* = 8.4 Hz, 1H), 6.98-7.06 (m, 2H). LC/MS (*m/z*): calcd. for C₃₀H₄₄NO₅S (M+H)⁺: 530.8; found: 530.2.

10 Example 79 and 80

Preparation of epimers of *D*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid methyl ester.



D-Epimer 1



D-Epimer 2

20 A racemic mixture of *D*-1-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid

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methyl ester (0.54 g) is chromatographed (CHIRALPAK AD column, 40% *i*-PrOH/Hept) to give epimer1, Example 79 (0.244 g, 45 %) and epimer 2, Example 80 (0.283 g, 52%).

Example 79, Epimer1 rt = 10.2 m

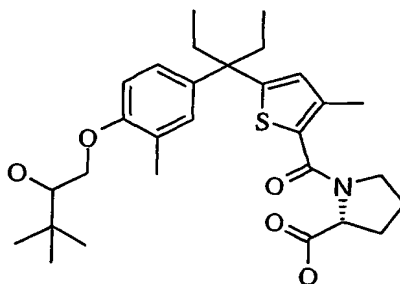
5 NMR & LC/MS: identical to 2158904 (*L*-epimer-2), Example 78.

Example 80, Epimer 2 rt = 18.1 m

NMR & LC/MS: identical to (*L*-epimer-1), Example 78.

10 Example 81

Preparation of epimer 1 of *D*-1-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid.



15 *D*-Epimer 1

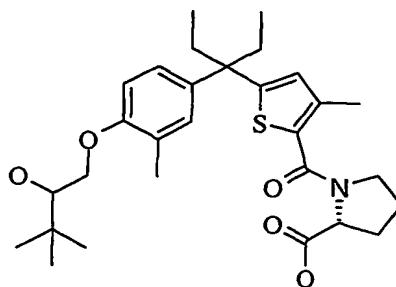
Using the procedure analogous to Example 53, epimer 1 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester (Example 79) (0.24g, 0.46 mmol) gives the title compound (0.15 g, 0.29 mmol, 63%). ¹H NMR and LC/MS:

20 identical to (*L*-enantiomer-2), Example 75.

Example 82

Preparation of epimer 2 of *D*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid.

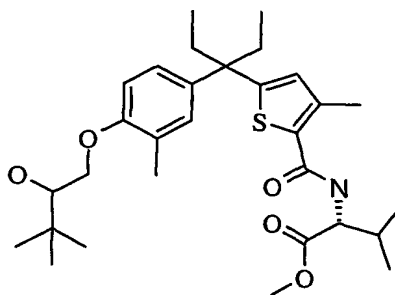
-223-

*D*-Enantiomer 2

Using a procedure analogous to Example 53, epimer-2 of *D*-1-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-pyrrolidine-2-carboxylic acid methyl ester (Example 80) (0.28 g, 0.53 mmol) gives the title compound (0.22 g, 0.43 mmol, 79%). ¹H NMR and LC/MS: identical to (*L*-epimer-1), Example 73.

Example 83

Preparation of *D*-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-butyric acid methyl ester

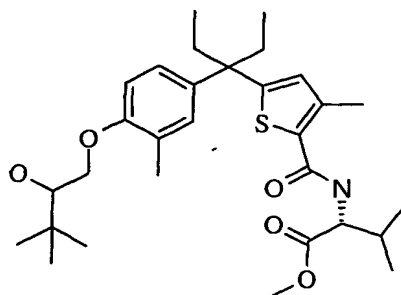
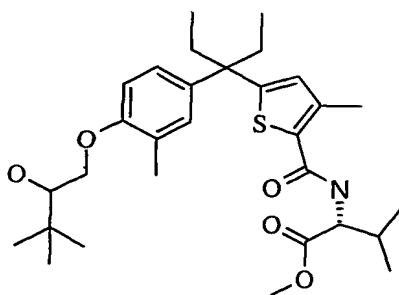
*D*-Racemic

Using a procedure analogous to Example 52, a racemic mixture of 5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (Example 3) (0.60 g, 1.39 mmol) and *D*-valine methyl ester hydrochloride salt (0.29 g, 1.53 mmol) to give the title compound (0.54 g, 1.02mmol, 73%). LC/MS (*m/z*): calcd. for C₃₀H₄₆NO₅S (M+H)⁺: 532.8; found: 532.2.

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Example 84 and 85

Preparation of epimers of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-butyric acid methyl ester.

*D*-Epimer 1*D*-Epimer 2

A racemic mixture of *D*-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-butyric acid methyl ester (Example 83) (0.54 g) is chromatographed (CHIRALPAK AD column, 40% *i*-PrOH/Hept) to give epimer 1, Example 84 (0.36 g, 48 %) and epimer 2, Example 85 (0.33 g, 45%).

Example 84, Epimer 1

rt = 6.8 m

¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.2 Hz, 6H), 0.96 (d, *J* = 6.6 Hz, 3H), 0.99 (d, *J* = 7.1 H, 3H), 1.02 (s, 9H), 2.04-2.15 (m, 4H), 2.18 (s, 3H), 2.20-2.21 (m, 2H), 2.47 (s, 3H), 3.71 (dd, *J* = 8.8, 2.6 Hz, 1H), 3.76 (s, 3H), 3.88 (t, *J* = 8.8 Hz, 1H), 4.11 (dd, *J* = 9.2,

-225-

2.6 Hz, 1H), 4.69 (dd, $J = 8.4, 4.9$ Hz, 1 H), 6.19 (d, $J = 8.4$ Hz, 1H), 6.60 (s, 1H), 6.73 (d, $J = 8.3$ Hz, 1H), 6.90-7.06 (m, 2H). LC/MS (m/z): calcd. for $C_{30}H_{46}NO_5S$ ($M+H$)⁺: 532.8; found: 532.2.

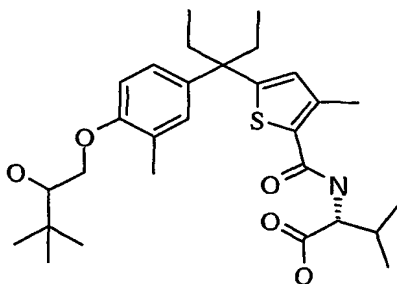
5 Example 85, Epimer 2

rt = 10.6 m

¹H NMR and LC/MS: identical to (*D*-enantiomer-1), example 33.

Example 86:

- 10 Preparation of epimer 1 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-butyric acid



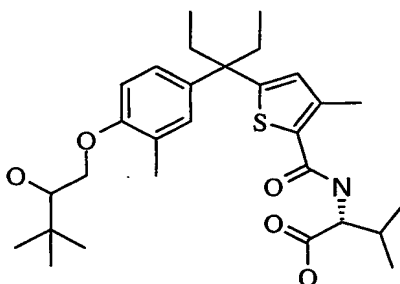
D-Epimer 1

- 15 Using the procedure analogous to Example 53, epimer 1 of *D*-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester (Example 84) (0.28g, 0.53 mmol) gives the title compound (0.22 g, 0.43 mmol, 79%). ¹H NMR (CDCl₃), δ 0.71 (t, $J = 7.4$ Hz, 6H), 1.00 (d, $J = 6.6$ Hz, 3H), 1.03 (s, 9H), 1.04 (d, $J = 6.6$ Hz, 3H), 2.04-2.14 (m, 4H), 2.21 (s, 3H), 2.25-2.35 (m, 1H), 2.47 (s, 3H), 3.72 (dd, $J = 8.4, 2.6$ Hz, 1H), 3.88 (t, $J = 9.2$ Hz, 1H), 4.10 (dd, $J = 9.2, 2.6$ Hz, 1H), 4.69 (dd, $J = 8.0, 4.4$ Hz, 1 H), 6.19 (d, $J = 8.0$ Hz), 6.60 (s, 1H), 6.73 (d, $J = 8.4$ Hz, 1H), 7.00 (dd, $J = 2.2$ Hz, 1H), 7.04 (dd, $J = 8.4, 2.6$ Hz, 1H). LC/MS (m/z): calcd. for $C_{29}H_{44}NO_5S$ ($M+H$)⁺: 518.7; found: 518.2.
- 20

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Example 87

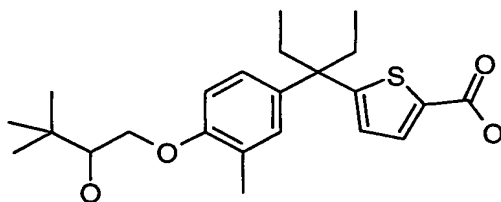
Preparation of epimer 2 of *D*-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-3-methyl-butyric acid.

*D*-Epimer 2

Using a procedure analogous to Example 53, epimer 2 of *D*-2-[(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-2-methyl-propionic acid methyl ester (Example 85) (0.33g, 0.62 mmol) gives the title compound (0.23 g, 0.44 mmol, 79%). ¹H NMR and LC/MS: equivalent to (*D*-epimer-1), Example 86.

Example 88

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



Using a procedure analogous to Example 3, 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.23 g,

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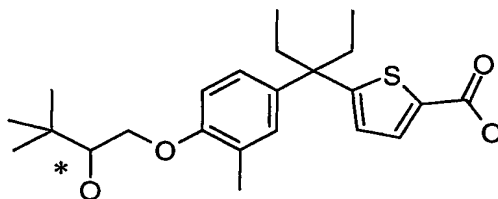
0.55 mmol) and 5N sodium hydroxide (220 ul, 1.1 mmol) give the title compound (0.18 g, 81%).

H-NMR (ppm, CDCl₃): 7.68 (1H, d, 4.0 Hz), 7.03 (1H, d, 8.2 Hz), 6.98 (1H, s), 6.79 (1H, d, 4.0 Hz), 6.72 (1H, d, 8.2 Hz), 4.09 (1H, d, 9.3 Hz), 3.85 (1H, t, 9.3 Hz), 3.73 (1H, d, 9.3 Hz), 2.19 (3H, s), 2.13 (4H, q, 7.0 Hz), 1.02 (9H, s), 0.71 (6H, t, 7.0 Hz).

ES/MS: 403.2 (M+1) 422.2 (M + NH₄).

Example 89 and 90

Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



A mixture of racemic 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (166 mg) is chromatographed with a ChiralPak AD column (10% IPA/hept to 15% IPA/hept) to give enantiomer 1 (63 mg), Example 89 and enantiomer 2 (67 mg), Example 90.

Enantiomer 1, Example 89

HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate); rt = 4.9 m; 225 nm.

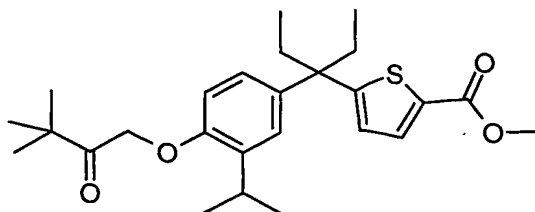
Enantiomer 2, Example 90

HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate); rt = 6.9 m; 225 nm.

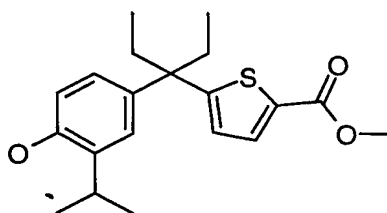
Example 91

Preparation of 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-(1-methylethyl)phenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.

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A. 3'-[4-(Hydroxy)-3-(1-methylethyl)phenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane.



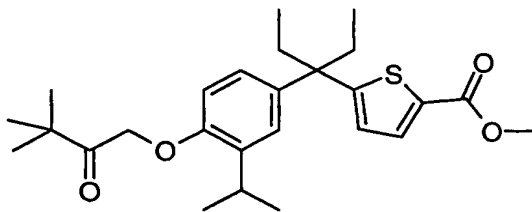
5

Methyl, 5-(E/Z-2-penten-3-yl)thiophene-2-carboxylate (Example 5C) (0.21 g, 1.0 mmol), o-isopropylphenol (1.09 g, 4.0 mmol), and BF₃-etherate (58 mg, 0.2 mmol) are reacted and purified as described in Example 5D to give the title compound (0.28 g, 81%).

10 H-NMR (ppm, CDCl₃): 7.62 (1H, d, 4.0 Hz), 7.05 (1H, s), 6.90 (1H, d, 8.8 Hz), 6.78 (1H, d, 4.0 Hz), 6.63 (1H, d, 8.8 Hz), 4.58 (1H, s), 3.83 (3H, s), 3.15 (1H, m), 2.11 (4H, q, 7.2 Hz), 1.21 (6H, d, 6.8 Hz), 0.71 (6H, t, 7.4 Hz).

ES/MS: 347.2 (M+1).

15 B. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-(1-methylethyl)phenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.



3'-[4-(Hydroxy)-3-(1-methylethyl)phenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane (0.18 g, 0.52 mmol), sodium hydride 60% (23 mg, 0.56 mmol), and 1-chloropinacolone (71 mg, 0.52 mmol) with a catalytic amount of

20

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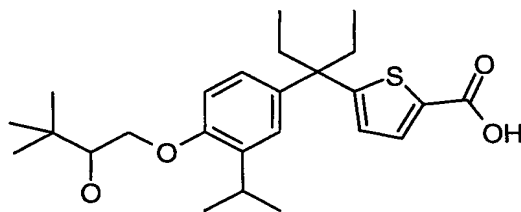
potassium iodide (7 mg, 0.04 mmol) are reacted and purified as described in Example 5E to give the title compound (0.13 g, 56%).

H-NMR (ppm, CDCl₃): 7.61 (1H, d, 4.0 Hz), 7.08 (1H, s), 6.93 (1H, d, 6.0 Hz), 6.77 (1H, d, 4.0 Hz), 6.52 (1H, d, 6.0 Hz), 4.84 (2H, s), 3.83 (3H, s), 3.38 (1H, m), 2.11 (4H, q, 7.2 Hz), 1.26 (9H, s), 1.19 (6H, d, 7.2 Hz), 0.71 (6H, t, 7.4 Hz).

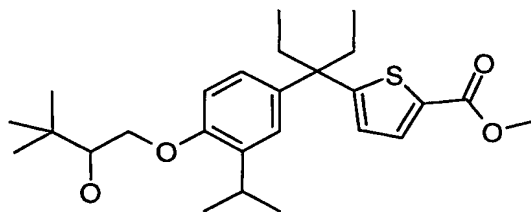
ES/MS: 445.2 (M+H) 462.2 (M + NH₄).

Example 92

3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-(1-methylethyl)phenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



A. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-(1-methylethyl)phenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.



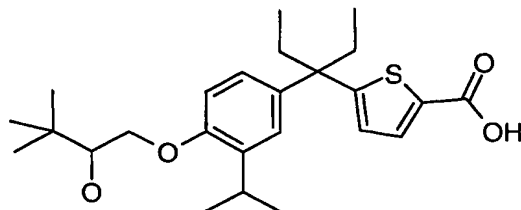
3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-(1-methylethyl)phenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (16 mg 0.26mmol) and sodium borohydride (9.8 mg, 0.26 mmol) are reacted in methanol and purified as described in Example 5F to give the title compound (93 mg, 80%).

H-NMR (ppm, CDCl₃): 7.63 (1H, d, 4.0 Hz), 7.08 (1H, s), 6.99 (1H, d, 9.0 Hz), 6.78 (1H, d, 4.0 Hz), 6.74 (1H, d, 9.0 Hz), 4.09 (1H, d, 8.2 Hz), 3.85 (1H, t, 8.2 Hz), 3.83 (3H, s), 3.72 (1H, d, 8.2 Hz), 3.25 (1H, m), 2.40 (1H, s), 2.12 (4H, q, 7.2 Hz), 1.17 (6H, d, 6.8 Hz), 1.02 (9H, s), 0.71 (6H, t, 7.2 Hz).

ES/MS: 447.2 (M+1).

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B. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-(1-methylethyl)phenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



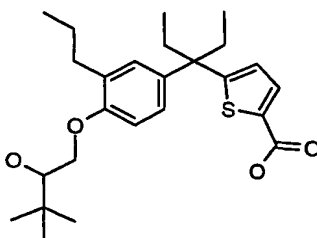
Using a procedure analogous to Example 3, 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-(1-methylethyl)phenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (93 mg, 0.21 mmol) and 5N sodium hydroxide (1 ml, 5 mmol) are reacted and purified to give the title compound (66 mg, 73%).

H-NMR (ppm, CDCl₃): 7.69 (1H, d, 4.0 Hz), 7.08 (1H, s), 6.99 (1H, d, 6.0 Hz), 6.80 (1H, d, 4.0 Hz), 6.74 (1H, d, 6.0 Hz), 4.08 (1H, d, 8.0 Hz), 3.84 (1H, t, 8.0 Hz), 3.73 (1H, d, 8.0 Hz), 3.25 (1H, m), 2.13 (4H, q, 6.8 Hz), 1.17 (6H, d, 6.0 Hz), 1.02 (9H, s), 0.72 (6H, t, 7.0 Hz).

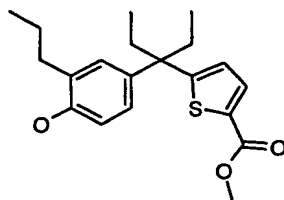
ES/MS: 431.2 (M-1) 450.2 (M + NH₄).

Example 93

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



A. 3'-(4-hydroxy-3-n-propylphenyl)-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.

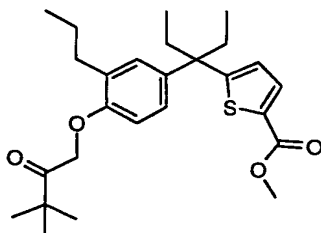


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To a mixture of o-propylphenol (1.09 g, 8.0 mol) and methyl, 5-(z/e-2-penten-3-yl)thiophene-2-carboxylate (0.21 g, 1.0 mmol) in methylene chloride (1 ml) is added BF₃-etherate (56 mg, 0.2 mmol) under nitrogen and stirred for 16 h. The mixture is partitioned between satd NaHCO₃ and diethylether. The organic layer is washed with water, Na₂SO₄ dried, and concentrated. The excess phenol is removed from the residue by vacuum distillation at 70 °C/0.04 mm. The residue is chromatographed (4% EtOAc/hex) to give the title compound as an oil (0.27 g, 78%).

NMR (CDCl₃): 7.62 (d, 1H, J = 3.6 Hz); 6.96 (s, 1H); 6.94 (d, 1H, J = 7.3 Hz); 6.77 (d, 1H, J = 3.6 Hz); 6.66 (d, 1H, J = 8.0 Hz); 4.61 (s, 1H); 3.83 (s, 3H); 2.55 (t, 2H, J = 7.3 Hz); 2.11 (q, 4H, J = 7.2 Hz); 1.60 (m, 2H); 0.93 (t, 3H, J = 7.3 Hz); 0.71 (t, 6H, J = 7.2 Hz). FAB/MS: 347 M+1.

B. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.

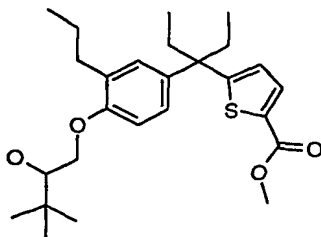


Using a procedure analogous to Example 91B, 3'-(4-hydroxy-3-n-propylphenyl)-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.27 g, 0.78 mmol) give the title compound as an oil (0.21 g, 60%).

NMR (CDCl₃): 7.61 (d, 1H, J = 4.4 Hz); 6.97 (s, 1H); 6.95 (d, 1H, J = 7.3 Hz); 6.77 (d, 1H, J = 4.4 Hz); 6.50 (d, 1H, J = 7.3 Hz); 4.83 (s, 2H); 3.83, (s, 3H); 2.61 (t, 2H, J = 7.3 Hz); 2.10 (q, 4H, J = 7.3 Hz); 1.59 (m, 2H); 1.26 (s, 9H); 0.90 (t, 3H, 7.3 Hz); 0.70 (t, 6H, 7.3 Hz).

FAB-MS: 444.3 molecular ion.

C. 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-methoxycarbonyl-



thiophen-2-yl]pentane.

To a mixture of 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.199 g, 0.45 mmol) and MeOH (5 ml) is added NaBH₄ (17 mg, 0.45 mmol) in portions. After stirring for 4.5 h at room temperature, the reaction is concentrated and partitioned between satd NaHCO₃ and diethylether. The organic layer is washed with water, Na₂SO₄ dried, and concentrated to give the title compound as an oil (0.18 g, 90%).

NMR(CDCl₃): 7.62 (d, 1H, J = 3.6 Hz); 7.02 (1H, d, J = 7.5 Hz); 6.98 (s, 1H); 6.78 (d, 1H, 3.6 Hz); 6.73 (d, 1H, 7.5 Hz); 4.08 (1H, d, J = 9.0); 3.85 (t, 1H, J = 9.0); 3.83 (s, 3H); 3.71 (d, 1H, J = 9.0 Hz); 2.55 (t, 2H, 7.5 Hz); 2.40 (s, 1H); 2.12 (q, 4H, J = 7.6 Hz); 1.55 (m, 2H); 1.02 (s, 9H); 0.90 (t, 3H, J = 7.6 Hz); 0.71 (t, 6H, J = 7.2 Hz). LC/MS: 447.2 M+1.

D. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.

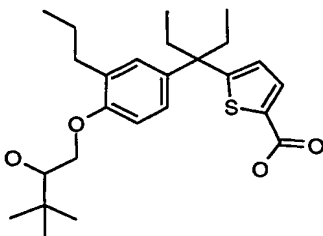
A mixture of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.18 g, 0.4 mmol), methanol (3 ml) and 5N NaOH (161 μ L, 0.8 mmol) is heated to 50°C for 16 h. The reaction mixture is concentrated and the residue dissolved in water (4 mL). The solution is added conc. HCl, filtered with water wash, and air dried to give the title compound (0.16 g, 92%).

NMR(CDCl₃): 7.69 (d, 1H, J = 4.0 Hz); 7.02 (d, 1H, J = 7.5 Hz); 6.98 (s, 1H); 6.79 (d, 1H, J = 4.0 Hz); 6.75 (d, 1H, J = 7.5 Hz); 5.29 (s, 1H); 4.08 (d, 1H, J = 9.0); 3.85 (t, 1H, J = 9.0 Hz); 3.70 (d, 1H, J = 9.0 Hz); 2.55 (t, 2H, J = 7.5 Hz); 2.13 (q, 4H, J = 7.2 Hz); 1.55 (m, 1H); 1.02 (s, 9H); 0.90 (t, 3H, H = 7.4 Hz); 0.72 (t, 6H, J = 7.4 Hz).

LC/MS: 413.2 M-1.

Example 94 and 95

Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



5

A mixture of racemic 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (200 mg) is chromatographed on a ChiralPak AD column with IPA/heptane. Enantiomer 1 is further chromatographed on 4g of Silica Gel from 0% EtOAc/Hex to 50% EtOAc/Hex over 38 min at 12 ml/min to give pure enantiomer 1 (66 mg), Example 94. Enantiomer 2 from ChiralPak is further chromatographed on 4g of Silica Gel from 0% EtOAc/Hex to 50% EtOAc/Hex over 38 min at 12 ml/min. to give pure enantiomer 2 (66 mg), Example 95.

10

Enantiomer 1, Example 94

HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate);

15

rt = 6.22 m; 225 nm.

Enantiomer 2, Example 95

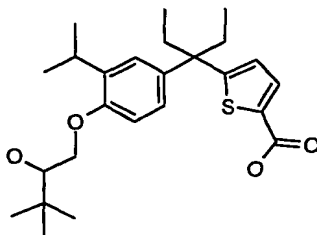
HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate); rt = 9.0 m; 225 nm.

20

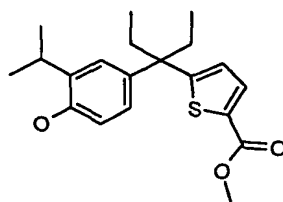
Example 96

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.

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A. 3'-(4-hydroxy-3-i-propylphenyl)-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.

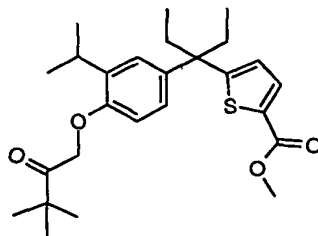


Using a procedure analogous to Example 93A, o-isopropylphenol (1.09 g, 8 mol) and methyl, 5-(E/Z-2-penten-3-yl)thiophene-2-carboxylate (0.21 g, 1.0 mol) give the title compound as an oil (0.28 g, 81%).

NMR (CDCl₃): 7.62 (d, 1H, J = 4.0 Hz); 7.05 (s, 1H); 6.90 (d, 1H, J = 8.4 Hz); 6.78 (d, 1H, J = 4.0 Hz); 6.63 (d, 1H, J = 8.8 Hz); 4.58 (s, 1H); 3.83 (s, 3H); 3.15 (m, 1H); 2.11 (q, 4H, J = 7.2 Hz); 1.21 (d, 6H, J = 6.1 Hz); 0.71 (t, 6H, J = 7.4 Hz).

LC/MS: 347.2 M+1.

B. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.



Using a procedure analogous to Example 91B, 3'-(4-hydroxy-3-i-propylphenyl)-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.28 g, 0.81 mmol) gives the title compound as an oil (0.13 g, 56%).

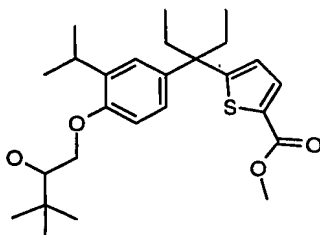
NMR (CDCl₃): 7.61 (d, 1H, J = 4.4 Hz); 7.09 (s, 1H); 6.94 (d, 1H, J = 8.4 Hz); 6.77 (d, 1H, J = 4.4 Hz); 6.53 (d, 1H, J = 8.4 Hz); 4.84 (s, 2H); 3.83, (s, 3H); 3.38 (m, 2H); 2.11 (q, 4H, J = 7.2 Hz); 1.26 (s, 9H); 1.19 (d, 6H, J = 7.2 Hz); 0.70 (t, 6H, 7.2 Hz).

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FAB-MS: 444.3 molecular ion.

LC/MS: 445.2 M+1 and 462.2 M+NH₄.

C. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.



Using a procedure analogous to Example 2, 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane gives the title compound as an oil (0.09 g, 80%).

10 NMR(CDCl₃): 7.62 (d, 1H, J = 3.6 Hz); 7.08 (s, 1H); 6.99 (1H, d, J = 8.8 Hz); 6.78 (d, 1H, 3.6 Hz); 6.73 (d, 1H, 8.8 Hz); 4.08 (1H, d, J = 8.8); 3.85 (t, 1H, J = 8.8); 3.83 (s, 3H); 3.71 (d, 1H, J = 8.8 Hz); 3.28 (m, 1H); 2.12 (q, 4H, J = 7.2 Hz); 1.17 (d, 6H, J = 6.8 Hz); 1.02 (s, 9H); 0.71 (t, 6H, J = 7.2 Hz).

LC/MS: 447.2 M+1.

15

D. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-carboxyl-thiophen-2-yl]pentane.

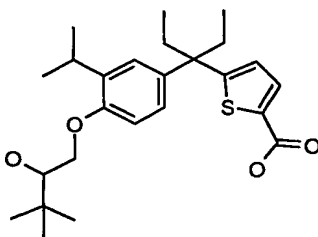
Using a procedure analogous to Example 3, 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.93 g, 0.21 mmol) and 5N NaOH aq (1 mL, 5 mmol) give the title compound as an oil (66 mg, 73%).

20 NMR(CDCl₃): 7.69 (d, 1H, J = 3.6 Hz); 7.08 (s, 1H); 6.98 (d, 1H, J = 8.1 Hz); 6.79 (d, 1H, J = 3.6 Hz); 6.74 (d, 1H, J = 8.1 Hz); 4.08 (d, 1H, J = 7.4); 3.85 (t, 1H, J = 7.4 Hz); 3.72 (d, 1H, J = 7.4 Hz); 3.25 (m, 1H); 2.13 (q, 4H, J = 6.8 Hz); 1.17 (d, 6H, J = 6.0 Hz);
25 1.02 (s, 9H); 0.72 (t, 6H, J = 6.8 Hz).

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LC/MS: 450.2 M+NH₄.Example 97 and Example 98

- 5 Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



- 10 A mixture of racemic 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-i-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (22 mg) is chromatographed on a ChiralPak AD column with IPA/heptane) to give enantiomer 1 (8 mg), Example 97 and enantiomer 2 (7 mg), Example 98.

Enantiomer 1, Example 97

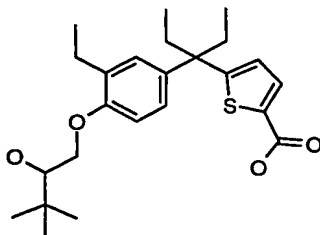
HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate); rt

- 15 Enantiomer 2, Example 98

HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate); rt = 6.53 m; 225 nm.

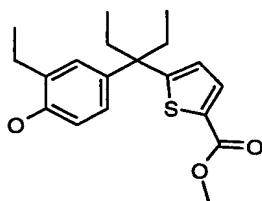
Example 99

- 20 Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



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A. 3'-(4-hydroxy-3-ethylphenyl)-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane.

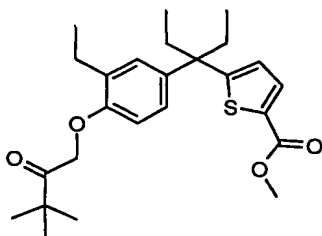


Using a procedure analogous to Example 93A, o-ethylphenol (0.98 g, 8.0 mol) and methyl, 5-(E/Z-2-penten-3-yl)thiophene-2-carboxylate (0.21 g, 1.0 mol) give the title compound as an oil (0.26 g, 78%).

NMR (CDCl₃): 7.62 (d, 1H, J = 4.0 Hz); 6.98 (s, 1H); 6.94 (d, 1H, J = 7.2 Hz); 6.78 (d, 1H, J = 4.0 Hz); 6.66 (d, 1H, J = 7.2 Hz); 4.60 (s, 1H); 3.83 (s, 3H); 2.59 (q, 2H, J = 7.7 Hz); 2.11 (q, 4H, J = 7.2 Hz); 1.19 (t, 3H, J = 7.6 Hz); 0.71 (t, 6H, J = 7.2 Hz).

FAB/MS: 333 M+1.

B. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-methoxycarbonyl-



thiophen-2-yl]pentane.

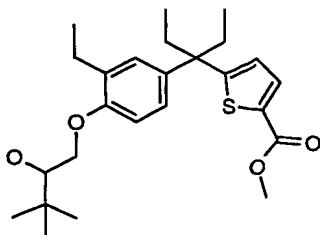
Using a procedure analogous to Example 91B, 3'-(4-hydroxy-3-ethylphenyl)-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.26 g, 0.78 mmol) gives the title compound as an oil (0.24 g, 71%).

NMR (CDCl₃): 7.61 (d, 1H, J = 3.6 Hz); 7.02 (s, 1H); 6.96 (d, 1H, J = 7.3 Hz); 6.77 (d, 1H, J = 3.6 Hz); 6.52 (d, 1H, J = 7.3 Hz); 4.83 (s, 2H); 3.83 (s, 3H); 2.66 (q, 2H, J = 7.3 Hz); 2.12 (q, 4H, J = 7.6 Hz); 1.21 (s, 9H); 1.18 (t, 3H, 7.3 Hz); 0.70 (t, 6H, 7.6 Hz).

LC/MS: 431.2 M+1.

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C. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-methoxycarbonyl-



thiophen-2-yl]pentane.

5 Using a procedure analogous to Example 2, 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane (0.22 g, 0.5 mmol) gives the title compound as an oil (0.16 g, 75%).

NMR(CDCl₃): 7.62 (d, 1H, J = 3.2 Hz); 7.01 (1H, d, J = 7.4 Hz); 7.00 (s, 1H); 6.78 (d, 1H, 3.2 Hz); 6.73 (d, 1H, 7.4 Hz); 4.08 (1H, d, J = 8.1); 3.85 (t, 1H, J = 8.1); 3.83 (s, 3H); 3.70 (d, 1H, J = 8.1 Hz); 2.60 (t, 2H, 7.6 Hz); 2.40 (s, 1H); 2.12 (q, 4H, J = 7.2 Hz); 1.49 (t, 3H, J = 7.2 Hz); 1.02 (s, 9H); 0.71 (t, 6H, J = 7.2 Hz).

LC/MS showed a 433.2 M+1.

15 D. 3'-[4-(2-Hydroxy-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxyl-thiophen-2-yl]pentane.

Using a procedure analogous to Example 3, 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-methoxycarbonyl-thiophen-2-yl]pentane, methanol, and 5N NaOH at 50 °C for 16 h to give the title compound (0.15 g, 94%).

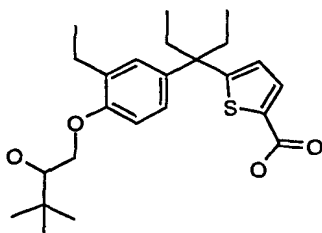
20 NMR(DMSO-D₆): 7.53 (d, 1H, J = 3.6 Hz); 7.01 (d, 1H, J = 8.8 Hz); 7.00 (s, 1H); 6.90 (d, 1H, J = 3.6 Hz); 6.85 (d, 1H, J = 8.8 Hz); 4.04 (d, 1H, J = 9.4); 3.86 (t, 1H, J = 9.4 Hz); 3.44 (d, 1H, J = 9.4 Hz); 2.56 (m, 2H); 2.09 (m, 4H); 1.08 (t, 3H, J = 8.0 Hz); 0.93 (s, 9H); 0.65 (t, 6H, J = 7.4 Hz).

LC/MS: 417.2 M-1.

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Example 100 and Example 101

Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



- 5 A mixture of racemic 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (140 mg) is chromatographed on a ChiralPak AD column with IPA/heptane to give enantiomer 1 (59 mg), Example 100 and enantiomer 2 (51 mg), Example 101.

Enantiomer 1, Example 100

- 10 HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate);
rt = 4.42 m; 225 nm..

Enantiomer 2, Example 101

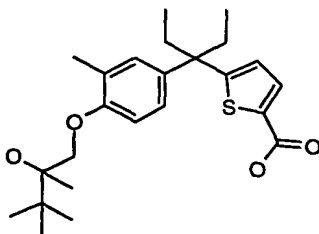
HPLC: ChiralPak AD (4.6X250 mm); 15% IPA/85% heptane; 1 ml/m (flow rate);
rt = 6.61 m; 225 nm.

15

Example 103

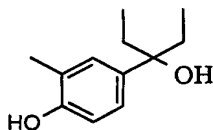
Preparation of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.

20



A. 3'-[4-Hydroxy-3-methylphenyl]pentan-3-ol.

-240-

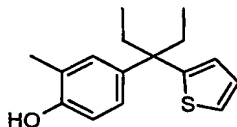


To a mixture of methyl, 4-hydroxy-3-methylbenzoate (21.8 g (0.13 mol) and 200 ml of THF is added 1 M ethylmagnesium bromide/THF (432 mL (0.43 mol) under nitrogen. The mixture is stirred for 60 h and quenched with satd NaHCO₃. The mixture is triturated five times with ether and the combined organic layers is washed with satd NaHCO₃ and brine. The organic layer is Na₂SO₄ dried, filtered, and concentrated to give 27 g (99%) of the title compound.

NMR (CDCl₃): 7.12 (s, 1H); 7.03 (d, 1H, 8.0 Hz); 6.72 (d, 1H, J = 8.0 Hz); 4.69 (s, 1H); 2.26 (s, 3H); 1.80 (m, 4H); 0.79 (t, 6H, 7.4 Hz).

ES/MS: 193 (M-1).

B. 3'-[4-Hydroxy-3-methylphenyl]-3'-(thiophen-2-yl)pentane.

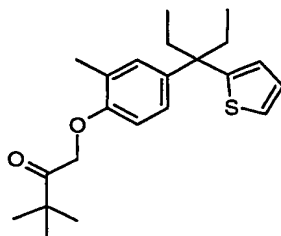


To a mixture of thiophene (6 mL) and 3'-[4-hydroxy-3-methylphenyl]pentan-3-ol (0.92 g, 5 mmol) is added boron trifluoride etherate (100 ul, 0.8 mmol). The mixture is stirred for 96 h and partitioned between diethyl ether and satd NaHCO₃. The organic layer is washed with satd NaHCO₃, brine, Na₂SO₄ dried, and concentrated. The residue is chromatographed (12 g of SiO₂, Hex to 8% EtOAc/Hex) to give the title compound (0.53 g (41%).

[ES/MS 259.1 (M-1)].

-241-

C. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-(thiophen-2-yl)pentane.

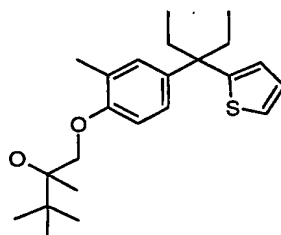


Using a procedure analogous to Example 91B, 3'-[4-hydroxy-3-methylphenyl]-3'-(thiophen-2-yl)pentane (0.53 g, 2.2 mmol) gives the title compound as an oil (0.47 g, 64%).

NMR (CDCl₃): 7.14 (d, 1H, J = 6.3 Hz); 7.03 (s, 1H); 6.98 (d, 1H, J = 9.0 Hz); 6.90 (m, 1H), 6.79 (d, 1H, J = 6.3 Hz), 6.52 (d, 1H, J = 9.0 Hz), 4.83 (s, 2H); 2.26 (s, 3H); 2.09 (m, 4H); 1.24 (s, 9H), 0.68 (t, 6H, 7.0 Hz).

ES/MS: 359.2 (M+1) 376.2 (M+NH₄).

D. 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-(thiophen-2-yl)pentane.



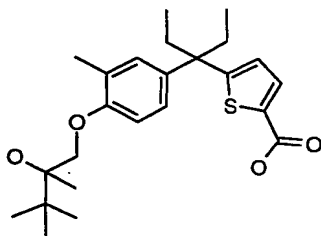
To a mixture of 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-(thiophen-2-yl)pentane (0.47 g (1.3 mmol) and diethyl ether (15 mL) is added 3 M methylmagnesium iodide/THF (1.3 ml, 3.9 mmol). After stirring for 2 h, the mixture is quenched with satd NaHCO₃ and triturated five times with diethyl ether. The combined organic layers is washed with water, brine, Na₂SO₄ dried, and concentrated to give the title compound (0.6 g, 99%).

NMR (CDCl₃): 7.13 (d, 1H, J = 5.0 Hz); 7.02 (s, 1H); 7.03 (d, 1H, J = 8.4 Hz); 6.90 (m, 1H), 6.80 (d, 1H, J = 5.0 Hz), 6.70 (d, 1H, J = 8.4 Hz), 4.00 (d, 1H, J = 8.8 Hz); 3.83 (d, 1H, J = 8.8 Hz); 2.27 (s, 1H); 2.21 (s, 3H); 2.11 (m, 4H); 1.32 (s, 3H); 1.05 (s, 9H), 0.70 (t, 6H, 7.2 Hz).

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ES-MS: 375.2 (M+1) 357.2 (M-H₂O).

E. 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



To a 0 °C mixture of 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-(thiophen-2-yl)pentane (0.6 g, 1.3 mmol) and cycloHex (20 ml) and ether (2 ml) is added 1.4 M sec-butyl lithium/cycloHex (2.85 ml, 3.2 mmol). The mixture is allowed to warm to RT and excess CO₂ gas is bubbled in. After two h, the mixture is partitioned between satd NaHCO₃ and diethyl ether. The aq phase is acidified with conc. perchloric acid and extracted into diethyl ether. The organic phase is washed with water, brine, Na₂SO₄ dried and concentrated. The residue is chromatographed (2% EtOAc/Hex to 50% EtOAc/Hex) to give of the title compound (0.3 g (44%).

NMR (CDCl₃): 7.69 (d, 1H, J = 3.6 Hz); 6.99 (s, 1H); 7.03 (d, 1H, J = 8.4 Hz); 6.80 (d, 1H, J = 3.6 Hz), 6.72 (d, 1H, J = 8.4 Hz), 4.00 (d, 1H, J = 8.8 Hz); 3.83 (d, 1H, J = 8.8 Hz); 2.22 (s, 3H); 2.13 (q, 4H, J = 7.2 Hz); 1.33 (s, 3H); 1.04 (s, 9H), 0.72 (t, 6H, 7.2 Hz).

ES-MS: 417.3 (M-1) 436.3 (M+NH₄).

Example 104 and Example 105

Preparation of enantiomers of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.

A mixture of racemic 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (~290 mg) is chromatographed on a ChiralPak AD column with IPA/heptane to give enantiomer 1 (125 mg, 43%), Example 104 and enantiomer 2 (140 mg, 48%), Example 105.

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Enantiomer 1, Example 104

HPLC: ChiralPak AD (4.6X250 mm); 20% IPA/80% heptane; 1 ml/m (flow rate);

rt = 6.09 m; 225 nm..

Enantiomer 2, Example 105

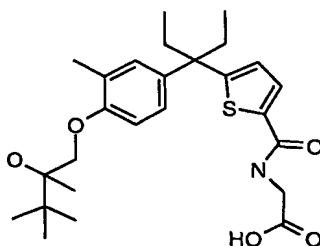
5 HPLC: ChiralPak AD (4.6X250 mm); 20% IPA/80% heptane; 1 ml/m (flow rate);

rt = 8.00 m; 225 nm.

Example 106

Preparation of enantiomer 1 of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-

10 3'-[5-(carboxymethylamino)carbonyl-thiophen-2-yl]pentane.



A. of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-[5-(methylcarbonyl-methylamino)carbonyl-thiophen-2-yl]pentane.

To a mixture of enantiomer 1 of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-

15 methylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane and DMSO (1 ml) is added EDCI (55 mg, 0.29 mmol), 0.5 M HOAT (523 uL, 0.26 mmol), methyl, aminoacetic acid hydrochloride (33 mg, 0.26 mmol), and triethylamine (136 uL, 1 mmol). The mixture is stirred for 72 h at RT, partitioned between diethyl ether and satd NaHCO₃. The organic layer is washed with water, 2M HCl, water, satd NaHCO₃, then Na₂SO₄ dried, and

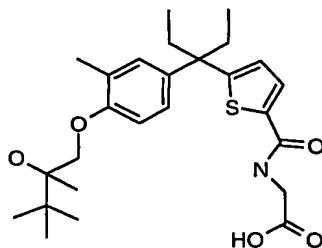
20 concentrated. The residue is chromatographed (Hex to 30% EtOAc/Hex) to give the title compound (60 mg, 51%).

NMR (CDCl₃): 7.40 (d, 1H, J = 3.6 Hz); 7.04 (d, 1H, J = 8.8 Hz); 6.98 (s, 1H); 6.77 (d, 1H, J = 3.6 Hz), 6.71 (d, 1H, J = 8.8 Hz), 4.00 (d, 1H, J = 8.8 Hz); 6.53 (m, 1H); 4.18 (d, 1H, J = 4.8 Hz); 4.00 (d, 1H, J = 8.8 Hz); 3.84 (d, 1H, J = 8.8 Hz); 3.78 (s, 3H); 2.21 (s, 3H); 2.11 (q, 4H, J = 7.2 Hz); 1.33 (s, 3H); 1.04 (s, 9H), 0.70 (t, 6H, 7.2 Hz).

ES-MS: 490.4 (M+1) 488.4 (M-1).

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B. 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-[5-(carboxymethyl-amino)carbonyl-thiophen-2-yl]pentane, enantiomer 1.



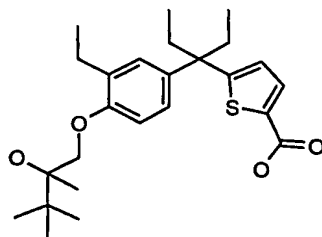
To a mixture of enantiomer 1 of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methylphenyl]-3'-[5-(methylcarbonyl-methylamino)carbonyl-thiophen-2-yl]pentane (60 mg, 0.12 mmol) and 50% methanol/water (0.5 ml) is added lithium hydroxide (6 mg, 0.24 mmol). The mixture is heated to 40 °C for one h and concentrated. The residue is added ice and acidified with conc. HCl (pH~1). The suspension is filtered, washed with water, and air dried to give the title compound as a solid (50 mg, 86%).

NMR (CDCl₃): 7.45 (d, 1H, J = 4.0 Hz); 7.04 (d, 1H, J = 8.4 Hz); 6.97 (s, 1H); 6.79 (d, 1H, J = 4.0 Hz), 6.70 (d, 1H, J = 8.4 Hz), 4.00 (d, 1H, J = 8.8 Hz); 6.59 (m, 1H); 4.17 (s, 1H); 4.00 (d, 1H, J = 8.8 Hz); 3.83 (d, 1H, J = 8.8 Hz); 3.02 (m, 1H); 2.20 (s, 3H); 2.11 (q, 4H, J = 7.2 Hz); 1.33 (s, 3H); 1.01 (s, 9H), 0.70 (t, 6H, 7.2 Hz).

ES/MS: 476.3 (M+1) 474.3 (M-1).

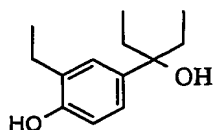
Example 107

Preparation of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



A. 3'-[4-Hydroxy-3-ethylphenyl]pentan-3-ol.

-245-

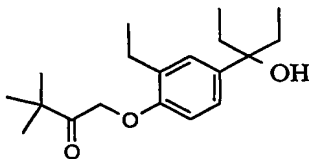


Using a procedure analogous to Example 103A, methyl, 4-hydroxy-3-ethylbenzoate (7.7g, 43 mmol) gives the title compound as an oil (9.2 g, 99%).

- 5 NMR (CDCl₃): 7.13 (s, 1H); 7.04 (d, 1H, 8.0 Hz); 6.71 (d, 1H, J = 8.0 Hz); 4.65 (s, 1H); 2.64 (q, 2H, J = 7.2 Hz); 1.81 (m, 4H); 1.23 (m, 3H); 0.77 (t, 6H, 7.2 Hz).
ES/MS: 207.1 (M-1).

B. 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-ethylphenyl]pentan-3-ol.

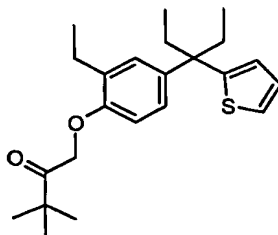
10



Using a procedure analogous to Example 91B, 3'-[4-hydroxy-3-ethylphenyl]pentan-3-ol (9.2 g, 43 mmol) gives the title compound (11.9 g, 91%).

- 15 NMR (CDCl₃): 7.14 (s, 1H); 7.10 (d, 1H, J = 8.0 Hz); 6.58 (d, 1H, J = 8.0 Hz); 4.85 (s, 2H); 2.71 (q, 2H, J = 7.6 Hz); 1.80 (m, 4H); 1.25 (s, 9H); 1.23 (t, 3H, J = 7.6 Hz); 0.76 (t, 6H, 7.2 Hz).
ES/MS: 289.1 (M+H-H₂O).

C. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-(thiophen-2-yl)pentane.



20

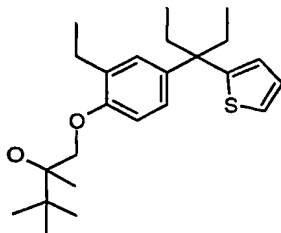
-246-

Using a procedure analogous to Example 103B, 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-ethylphenyl]pentan-3-ol (10.9 g, 36 mmol) gives the title compound (6.1 g, 46%).

NMR (CDCl₃): 7.14 (d, 1H, J = 1.2 Hz); 7.06 (s, 1H); 6.96 (d, 1H, J = 8.4 Hz); 6.90 (t, 1H, J = 5.2 Hz); 6.80 (d, 1H, J = 1.2 Hz); 6.52 (d, 1H, J = 8.4 Hz); 4.83 (s, 2H); 2.67 (q, 2H, J = 7.2 Hz); 2.10 (q, 4H, J = 7.4); 1.25 (s, 9H); 1.20 (t, 3H, J = 7.2 Hz); 0.70 (t, 6H, 7.4 Hz).

ES/MS: 373.2 (M+1) 390.2 (M+NH₄).

- 10 D. 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-(thiophen-2-yl)pentane.



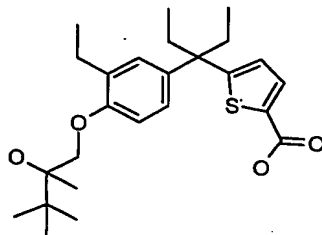
Using a procedure analogous to Example 103D, 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-ethylphenyl]-3'-(thiophen-2-yl)pentane (3.7 g, 10 mmol) gives the title compound after silica gel chromatography (1.8 g, 46%).

- 15 NMR (CDCl₃): 7.15 (d, 1H, J = 6.3 Hz); 7.04 (s, 1H); 7.03 (d, 1H, underlying); 6.90 (t, 1H, J = 5.2 Hz); 6.81 (m, 1H); 6.53 (d, 1H, J = 8.4 Hz); 4.00 (d, 1H, J = 8.4 Hz); 3.84 (d, 1H, J = 8.4 Hz); 2.62 (q, 2H, J = 7.6 Hz); 2.11 (q, 4H, J = 7.6); 1.33 (s, 3H); 1.16 (t, 3H, J = 7.6 Hz); 1.04 (s, 9H); 0.71 (t, 6H, 7.6 Hz).

ES/MS: 371.2 (M-H₂O+1) 389.2 (M+1).

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E. 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



Using a procedure analogous to Example 103E, 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-(thiophen-2-yl)pentane (1.45 g, 3.7 mmol) gives the title compound (0.75 g, 46%).

NMR (CDCl₃): 7.70 (d, 1H, J = 3.6 Hz); 7.02 (s, 1H); 7.03 (d, 1H, underlying); 6.80 (d, 1H, J = 3.6 Hz); 6.73 (d, 1H, J = 8.4 Hz); 4.00 (d, 1H, J = 8.8 Hz); 3.85 (d, 1H, J = 8.8 Hz); 2.62 (q, 2H, J = 7.6 Hz); 2.14 (q, 4H, J = 7.2); 1.33 (s, 3H); 1.17 (t, 3H, J = 7.6 Hz); 1.04 (s, 9H); 0.72 (t, 6H, 7.2 Hz).

ES/MS: 431.5 (M-1).

Example 108 and Example 109

Preparation of enantiomers of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.

enantiomer 1

enantiomer 2

A mixture of racemic 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (0.93 g) is chromatographed (ChiralPak AD column; 5% ethyl alcohol/95% Hept to give enantiomer 1 (453 mg), Example 108 and enantiomer 2 (438 mg), Example 109.

Enantiomer 1, Example 108

HPLC: ChiralPak AD (4.6X250 mm); 5% IPA/95% heptane; 1 ml/m (flow rate); rt = 10.2 m; 225 nm..

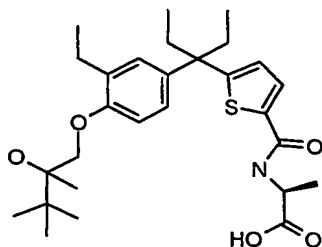
-248-

Enantiomer 2, Example 109

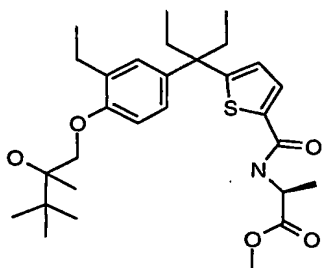
HPLC: ChiralPak AD (4.6X250 mm); 5% IPA/95% heptane; 1 ml/m (flow rate); t_r = 13.0 m; 225 nm.

5 Example 110

Preparation of enantiomer 1 of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane,.



10 A. Enantiomer 1 of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-(methoxycarbonyl-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



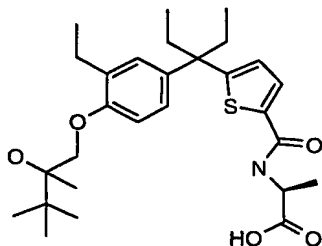
15 Using a procedure analogous to Example 106A, enantiomer 1 of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (310 mg, 0.71 mmol) and d-alanine methylester HCl give the title compound (173 mg, 47%).

NMR (CDCl₃): 7.39 (d, 1H, J = 4.0 Hz); 7.01 (s, 1H); 7.02 (d, 1H, underlying); 6.78 (d, 1H, J = 4.0 Hz); 6.64 (d, 1H, J = 8.0 Hz); 6.38 (d, 1H, J = 6.5 Hz); 4.74 (m, 1H); 4.00 (d, 1H, J = 7.2 Hz); 3.85 (d, 1H, J = 7.2 Hz); 3.77 (s, 3H); 2.62 (q, 2H, J = 7.6 Hz); 2.22 (s, 1H); 2.11 (q, 4H, J = 7.6); 1.48 (d, 3H, J = 7.2 Hz); 1.33 (s, 3H); 1.17 (t, 3H, J = 7.6 Hz); 1.04 (s, 9H); 0.71 (t, 6H, 7.2 Hz).

20

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B. Enantiomer 1 of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



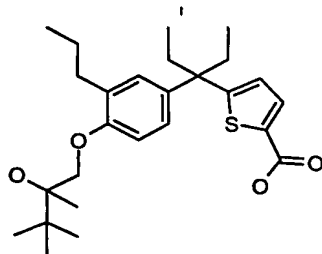
Using a procedure analogous to Example 106B, enantiomer 1 of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-ethylphenyl]-3'-[5-(methoxycarbonyl-1-ethylamino)carbonyl-thiophen-2-yl]pentane (173 mg, 0.33 mmol) gives the title compound as a solid (147 mg, 87%).

NMR (CDCl₃): 7.43 (d, 1H, J = 3.6 Hz); 7.01 (s, 1H); 7.02 (d, 1H, underlying); 6.79 (d, 1H, J = 3.6 Hz); 6.73 (d, 1H, J = 8.0 Hz); 6.35 (d, 1H, J = 8.0 Hz); 4.70 (m, 1H); 4.00 (d, 1H, J = 8.8 Hz); 3.84 (d, 1H, J = 8.8 Hz); 2.61 (q, 2H, J = 7.6 Hz); 2.10 (q, 4H, J = 7.2); 1.52 (d, 3H, J = 7.6 Hz); 1.32 (s, 3H); 1.15 (t, 3H, J = 7.6 Hz); 1.03 (s, 9H); 0.70 (t, 6H, 7.2 Hz).

ES/MS: 504.2 (M+1) 502.3 (M-1).

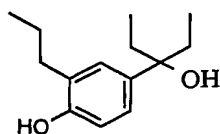
Example 111

Preparation of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



A. 3'-[4-Hydroxy-3-n-propylphenyl]pentan-3-ol.

-250-

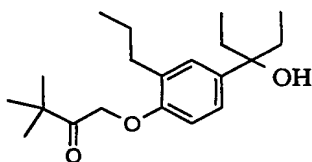


Using a procedure analogous to Example 103A, ethyl 4-hydroxy-3-n-propylbenzoate (5.0, 24 mmol) gives the title compound as an oil (5.7 g, 99%).

- 5 NMR (CDCl₃): 7.09 (s, 1H); 7.04 (d, 1H, 8.4 Hz); 6.71 (d, 1H, J = 8.4 Hz); 4.62 (s, 1H); 3.75 (m, 1H); 2.59 (t, 2H, J = 7.4 Hz); 1.80 (m, 4H); 1.64 (m, 2H); 0.94 (t, 3H, J = 7.4 Hz); 0.76 (t, 6H, 7.6 Hz).

ES/MS: 205.1 (M+H-H₂O).

- 10 B. 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-n-propylphenyl]pentan-3-ol.

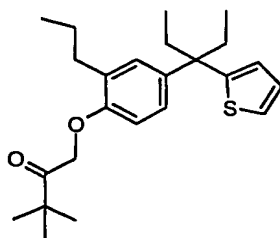


Using a procedure analogous to Example 91B, 3'-[4-hydroxy-3-n-propylphenyl]pentan-3-ol (5.7 g, 24 mmol) gives the title compound (7.1 g, 93%).

- 15 NMR (CDCl₃): 7.11 (s, 1H); 7.09 (d, 1H, J = 8.0 Hz); 6.57 (d, 1H, J = 8.0 Hz); 4.84 (s, 2H); 2.66 (t, 2H, J = 7.6 Hz); 1.80 (m, 4H); 1.65 (m, 2H); 1.26 (s, 9H); 0.95 (t, 3H, J = 7.2 Hz); 0.76 (t, 6H, 7.4 Hz).

ES/MS: 303.1 (M- H₂O+1).

- 20 C. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-(thiophen-2-yl)pentane.



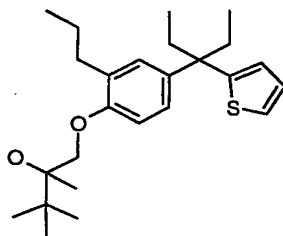
-251-

Using a procedure analogous to Example 103B, 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-n-propylphenyl]pentan-3-ol (7.1 g, 22 mmol) gives the title compound after silica gel chromatography (4.0 g, 47%).

NMR (CDCl₃): 7.12 (d, 1H, J = 1.2 Hz); 7.03 (s, 1H); 6.97 (d, 1H, J = 8.0 Hz); 6.90 (t, 1H, J = 5.2 Hz); 6.80 (d, 1H, J = 1.2 Hz); 6.51 (d, 1H, J = 8.0 Hz); 4.82 (s, 2H); 2.62 (t, 2H, J = 7.8 Hz); 2.09 (q, 4H, J = 7.6); 1.59 (m, 2H); 1.25 (s, 9H); 0.90 (m, 3H); 0.71 (t, 6H, 7.6 Hz).

ES/MS: 387.2 (M+1) 404.2 (M+NH₄).

- 10 D. 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-(thiophen-2-yl)pentane.



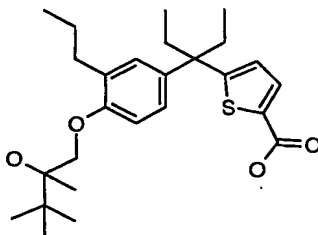
Using a procedure analogous to Example 103D, 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-n-propylphenyl]-3'-(thiophen-2-yl)pentane (1.3 g, 3.4 mmol) gives the title compound (1.2 g, 86 %).

NMR (CDCl₃): 7.13 (d, 1H, J = 6.0 Hz); 7.03 (s, 1H); 7.04 (d, 1H, underlying); 6.90 (t, 1H, J = 5.2 Hz); 6.8 (d, 1H, J = 6.0 Hz); 6.73 (d, 1H, J = 8.4 Hz); 3.99 (d, 1H, J = 8.4 Hz); 3.84 (d, 1H, J = 8.4 Hz); 2.57 (q, 2H, J = 7.6 Hz); 2.32 (s, 1H); 2.11 (q, 4H, J = 7.6); 1.56 (m, 2H); 1.32 (s, 3H); 1.04 (s, 9H); 0.90 (t, 3H, J = 7.4 Hz); 0.71 (t, 6H, 7.6 Hz).

ES/MS: 403.2 (M+1).

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E. 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



Using a procedure analogous to Example 103E, 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-(thiophen-2-yl)pentane (1.2 g, 2.9 mmol) gives the title compound (0.53 g, 41%).

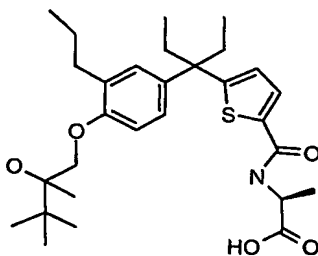
NMR (CDCl₃): 7.70 (d, 1H, J = 3.6 Hz); 7.03 (d, 1H, J = 8.0 Hz); 6.98 (s, 1H); 6.80 (d, 1H, J = 3.6 Hz); 6.74 (d, 1H, J = 8.0 Hz); 4.00 (d, 1H, J = 8.8 Hz); 3.84 (d, 1H, J = 8.8 Hz); 2.57 (t, 2H, J = 8.0 Hz); 2.13 (q, 4H, J = 7.0); 1.57 (m, 2H); 1.33 (s, 3H);

1.05 (s, 9H); 0.92 (t, 3H, J = 7.2 Hz); 0.72 (t, 6H, 7.0 Hz).

ES/MS: 445.5 (M-1).

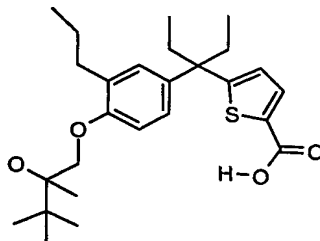
Example 114

Preparation of enantiomer 1 of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



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A. Enantiomers of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.



enantiomer 1

enantiomer 2

A racemic mixture of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (0.265 g) is chromatographed (ChiralPak AD column; 0.1%TFA in IPA/heptane to give enantiomer 1 (130 mg; TFA occluded, ~49%), Example 112 and enantiomer 2 (105 mg; TFA occluded, ~40%), Example 113.

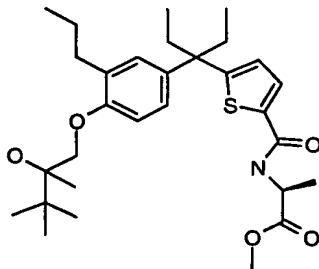
Enantiomer 1, Example 112

HPLC: ChiralPak AD (4.6X250 mm); 20% IPA/80% heptane; 1 ml/m (flow rate); rt = 5.3 m; 225 nm..

Enantiomer 2, Example 113

HPLC: ChiralPak AD (4.6X250 mm); 20% IPA/80% heptane; 1 ml/m (flow rate); rt = 6.7 m; 225 nm.

B. Enantiomer 1 of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-(methoxycarbonyl-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



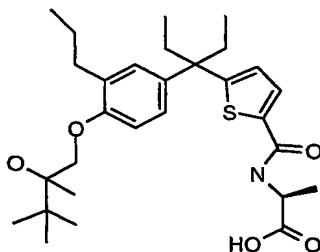
-254-

Using a procedure analogous to Example 106A, enantiomer 1 of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (130 mg, 0.3 mmol) and d-alanine methylester HCl give the title compound (49 mg, 32%).

NMR (CDCl₃): 7.39 (d, 1H, J = 3.6 Hz); 6.99 (s, 1H); 7.02 (d, 1H, J = 8.4 Hz); 6.76 (d, 1H, J = 3.6 Hz); 6.73 (d, 1H, J = 8.4 Hz); 6.38 (d, 1H, J = 7.0 Hz); 4.73 (m, 1H); 4.00 (d, 1H, J = 7.6 Hz); 3.85 (d, 1H, J = 7.6 Hz); 3.77 (s, 3H); 2.55 (t, 2H, J = 8.0 Hz); 2.21 (s, 1H); 2.11 (q, 4H, J = 7.2); 1.56 (m, 2H); 1.47 (d, 3H, J = 6.8 Hz); 1.33 (s, 3H); 1.03 (s, 9H); 0.91 (t, 3H, J = 7.6 Hz); 0.71 (t, 6H, 7.4 Hz).

ES/MS: 532.2 (M+1) 530.3 (M-1).

C. Enantiomer 1 of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



Using a procedure analogous to Example 106B, enantiomer 1 of 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-n-propylphenyl]-3'-[5-(methoxycarbonyl-1-ethylamino)carbonyl-thiophen-2-yl]pentane (48 mg, 0.1 mmol) gives the title compound as a solid (38 mg, 81%).

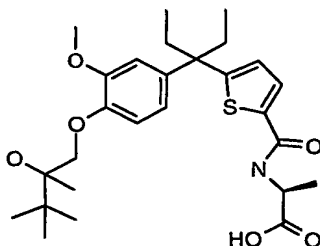
NMR (CDCl₃): 7.43 (d, 1H, J = 4.0 Hz); 6.97 (s, 1H); 7.02 (d, 1H, J = 8.4 Hz); 6.79 (d, 1H, J = 4.0 Hz); 6.73 (d, 1H, J = 8.4 Hz); 6.28 (d, 1H, J = 7.0 Hz); 4.70 (m, 1H); 3.99 (d, 1H, J = 8.8 Hz); 3.84 (d, 1H, J = 8.8 Hz); 2.56 (t, 2H, J = 7.8 Hz); 2.11 (q, 4H, J = 8.0); 1.56 (m, 2H); 1.53 (d, 3H, J = 7.6 Hz); 1.33 (s, 3H); 1.04 (s, 9H); 0.91 (t, 3H, J = 7.8 Hz); 0.71 (t, 6H, 8.0 Hz).

ES/MS: 518.2 (M+1) 516.2 (M-1).

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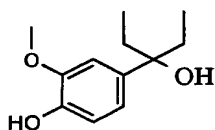
Example 115

Preparation of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



5

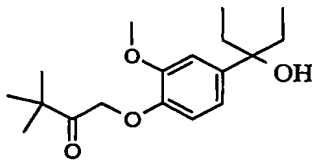
A. 3'-[4-Hydroxy-3-methoxyphenyl]pentan-3-ol.



- 10 Using a procedure analogous to Example 103A, methyl, 4-hydroxy-3-methoxybenzoate (7.3, 40 mmol) gives the title compound as an oil (7.7g, 91%).
NMR (CDCl₃): 6.96 (s, 1H); 6.86 (d, 1H, 8.4 Hz); 6.98 (d, 1H, J = 8.4 Hz); 5.51 (s, 1H); 3.90 (s, 3H); 1.81 (m, 4H); 0.78 (t, 6H, 7.6 Hz).
ES/MS: 193.0 (M+H-H₂O).

15

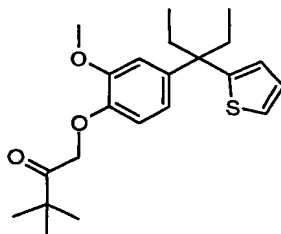
B. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methoxyphenyl]pentan-3-ol.



- Using a procedure analogous to Example 91B, 3'-[4-hydroxy-3-methoxyphenyl]pentan-3-ol (7.7g, 36 mmol) gives the title compound (10 g, 89%).
20 NMR (CDCl₃): 6.97 (s, 1H); 6.78 (d, 1H, J = 8.4 Hz); 6.66 (d, 1H, J = 8.4 Hz); 4.93 (s, 2H); 3.88 (s, 3H); 1.80 (m, 4H); 1.23 (s, 9H); 0.76 (t, 6H, 7.2 Hz).
ES/MS: 291.1 (M+H-H₂O).

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C. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methoxyphenyl]-3'-(thiophen-2-yl)pentane.

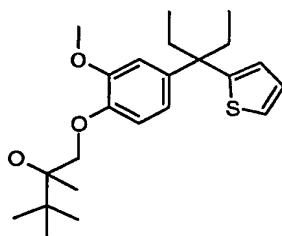


Using a procedure analogous to Example 103B, 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methoxyphenyl]pentan-3-ol (4.9 g, 16 mmol) gives the title compound (1.5 g, 25%).

NMR (CDCl₃): 7.13 (d, 1H, J = 5.2 Hz); 6.89 (t, 1H, J = 4.2 Hz); 6.80 (d, 1H, J = 4.8 Hz); 6.76 (m, 2H); 6.60 (d, 1H, J = 9.2 Hz); 4.91 (s, 2H); 3.78 (s, 3H); 2.10 (q, 4H, J = 7.2); 1.28 (s, 9H); 0.70 (t, 6H, 7.2 Hz).

ES-MS: 375.2 (M+1) 393.2 (M+NH₄).

D. 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-(thiophen-2-yl)pentane.



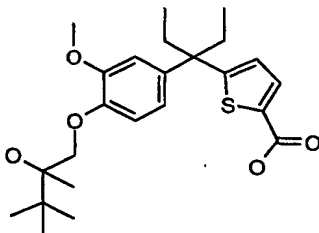
Using a procedure analogous to Example 103D, 3'-[4-(2-oxo-3,3-dimethylbutoxy)-3-methoxyphenyl]-3'-(thiophen-2-yl)pentane (1.5 g, 4 mmol) gives the title compound (1.4 g, 89 %).

NMR (CDCl₃): 7.13 (d, 1H, J = 5.0 Hz); 6.90 (t, 1H, J = 8.4 Hz); 8.81 (m, 3H); 6.76 (s, 1H); 3.98 (d, 1H, J = 8.8 Hz); 3.90 (d, 1H, J = 8.8 Hz); 3.75 (s, 3H); 2.76 (s, 1H); 2.11 (q, 4H, J = 7.2); 1.85 (m, 1H); 1.31 (s, 3H); 1.02 (s, 9H); 0.70 (t, 6H, 7.2 Hz).

ES/MS: 373.2 (M+H-H₂O).

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E. 3'-[4-(2-Hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane.

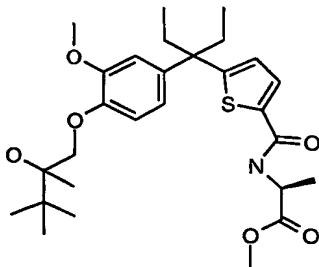


Using a procedure analogous to Example 103E, 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-(thiophen-2-yl)pentane (1.4 g, 3.5 mmol) gives the title compound (1.2 g, 77%).

NMR (CDCl₃): 7.70 (d, 1H, J = 3.6 Hz); 6.81 (m, 3H); 6.72 (d, 1H, J = 3.6 Hz); 3.99 (d, 1H, J = 9.2 Hz); 3.91 (d, 1H, J = 9.2 Hz); 3.76 (s, 3H); 2.13 (q, 4H, J = 7.2); 1.32 (s, 3H); 1.02 (s, 9H); 0.73 (t, 6H, 7.2 Hz).

ES/MS: 433.2 (M-1).

F. d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-(methoxycarbonyl-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



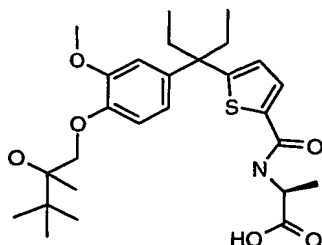
Using a procedure analogous to Example 106A, 3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-carboxy-thiophen-2-yl]pentane (600 mg, 1.4 mmol) and d-alanine methylester HCl give the title compound (206 mg, 28 %).

NMR (CDCl₃): 7.39 (d, 1H, J = 3.6 Hz); 6.81 (s, 2H); 6.77 (d, 1H, J = 3.6 Hz); 6.72 (s, 1H); 6.40 (d, 1H, J = 7.6 Hz); 4.75 (m, 1H); 3.99 (d, 1H, J = 7.6 Hz); 3.90 (d, 1H, J = 7.6 Hz); 3.77 (s, 3H); 3.75 (s, 3H); 2.72 (s, 1H); 2.11 (q, 4H, J = 7.2); 1.48 (d, 3H, J = 7.6 Hz); 1.31 (s, 3H); 1.02 (s, 9H); 0.71 (t, 6H, 7.2 Hz).

ES/MS: 520.2 (M+1) 518.2 (M-1).

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G. d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane.



5

Using a procedure analogous to Example 106B, d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-(methoxycarbonyl-1-ethylamino)carbonyl-thiophen-2-yl]pentane (140 mg, 0.3 mmol) gives the title compound as a solid (134 mg, 98 %).

10 NMR (CDCl₃): 7.44 (d, 1H, J = 4.0 Hz); 6.80 (m, 3H); 6.71 (s, 1H); 6.38 (d, 1H, J = 7.0Hz); 4.70 (m, 1H); 3.99 (d, 1H, J = 9.2 Hz); 3.91 (d, 1H, J = 9.2 Hz); 2.11 (q, 4H, J = 7.4); 1.54 (d, 3H, J = 6.8 Hz); 1.32 (s, 3H); 1.02 (s, 9H); 0.72 (t, 6H, 7.4 Hz).

ES/MS: 504.2 (M-1).

15

20

Example 116 and 117

Preparation of enantiomers of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane.

25

enantiomer 1

enantiomer 2

A racemic mixture of d-3'-[4-(2-hydroxy-2,3,3-trimethylbutoxy)-3-methoxyphenyl]-3'-[5-(carboxy-1-ethylamino)carbonyl-thiophen-2-yl]pentane (0.133

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g) is chromatographed (ChiralPak AD column; 0.1%TFA in IPA/Hept) to give enantiomer 1 (72 mg, quant), Example 116 and enantiomer 2 (78 mg, quant), Example 117.

Enantiomer 1, Example 116

- 5 HPLC: ChiralPak AD (4.6X250 mm); 40% IPA/60% heptane; 1 ml/m (flow rate);
rt = 5.1 m; 225 nm.

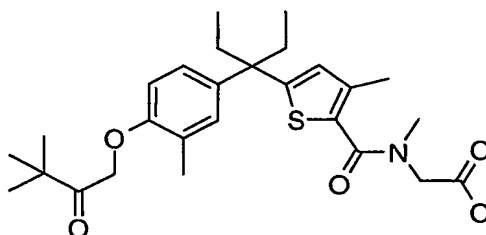
Enantiomer 2, Example 117

HPLC: ChiralPak AD (4.6X250 mm); 40% IPA/60% heptane; 1 ml/m (flow rate);
rt = 6.2 m; 225 nm.

10

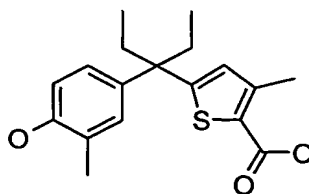
Example 118

Preparation of N-methyl- 2-[(5-{ 1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid.



15

- A. 5-[1-Ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophene-2-carboxylic acid.



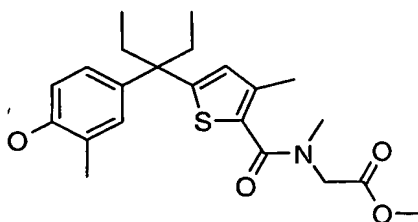
20

Using a procedure analogous to Example 47, 5-[1-Ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophene-2-carboxylic acid methyl ester, (Example 1F) (6.68 g, 20.12 mmol) gives the title compound (6.30 g, 19.81 mmol, 90%). ¹H NMR (CDCl₃), δ 0.71 (t, J = 6.9 Hz, 6H), 2.11 (q, J = 6.9 Hz, 4H), 2.23 (s, 3H), 2.48

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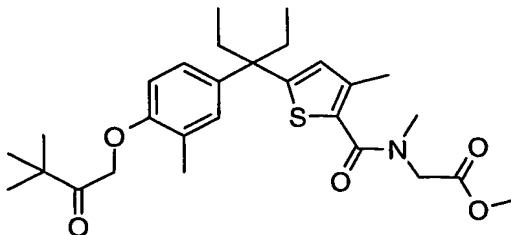
(s, 3H), 6.61 (s, 1H), 6.69 (d, $J = 7.9$ Hz, 1H), 6.94-7.00 (m, 2H). LC/MS (m/z): calcd for $C_{18}H_{22}O_3S$: 318.1; found: 318.1.

B. N-methyl-2-{5-[1-Ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophene-2-carbonyl}-methylamino)-acetic acid methyl ester.



Using a procedure analogous to Example 38, from [1-ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophene-2-carboxylic acid (1.90 g, 5.96 mmol) and sarcosine methyl ester hydrochloride (0.89 g, 6.55 mmol) gives the title compound (1.99 g, 4.94 mmol, 83 %). 1H NMR ($CDCl_3$), d 0.70 (t, $J = 7.1$ Hz, 6H), 2.01-2.09 (m, 4H), 2.21 (s, 3H), 2.24 (s, 3H), 3.10 (s, 3H), 3.74 (s, 3H), 4.20 (bs, 2H), 6.52 (s, 1H), 6.63 (d, $J = 8.4$ Hz, 1H), 6.90-7.01 (m, 2H). LC/MS (m/z): calcd for $C_{22}H_{30}NO_4S$ ($M+H$) $^+$: 404.2; found: 404.2.

C. N-methyl-2-[(5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid methyl ester

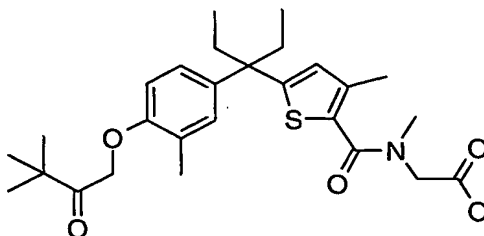


Using a procedure analogous to Example 1G, from 2-({5-[1-Ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophene-2-carbonyl}-methylamino)-acetic acid methyl ester (1.99 g, 4.94 mmol) gives the title compound (1.14 g, 2.28 mmol, 46%). 1H NMR ($CDCl_3$), d 0.70 (t, $J = 7.4$ Hz, 6H), 1.27 (s, 9H), 2.00-2.14 (m, 4H), 2.24 (s, 3H), 2.26 (s, 3H), 3.01 (s, 3H), 3.75 (s, 3H), 4.16-4.24 (bs, 2H), 4.84

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(s, 2H), 6.49-6.53 (m, 2H), 6.90-7.03 (m, 2H). LC/MS (m/z): calcd for $C_{28}H_{40}NO_5S$ (M+H)⁺: 502.7; found: 502.2.

D. N-methyl-2-[(5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid

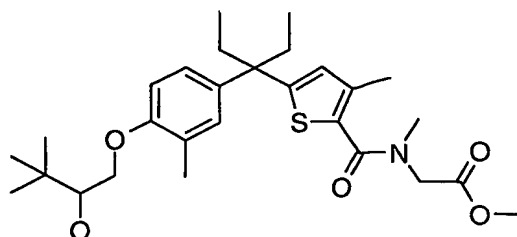


To a mixture of 2-[(5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid methyl ester (0.16 g, 0.32 mmol) and THF (2 mL) is added and H₂O (2mL) and 1.0 M NaOH (0.35 mL, 0.35 mmol). The reaction is stirred at RT overnight, acidified with 0.1 M HCl to pH 3-4 and extracted with EtOAc (2 x 30 mL). The organic layer is MgSO₄ dried and concentrated to give the title compound (0.14 g, 90%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.2 Hz, 6H), 1.27 (s, 9H), 2.02-2.10 (m, 4H), 2.24 (s, 3H), 2.26 (s, 3H), 3.12 (s, 3H), 4.21 (bs, 2H), 4.86 (s, 2H), 6.49-6.55 (m, 2H), 6.96-7.03 (m, 2H). LC/MS (m/z): calcd for $C_{27}H_{38}NO_5S$ (M+H)⁺: 488.7; found: 488.2.

Example 119

Preparation of N-methyl-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid methyl ester.

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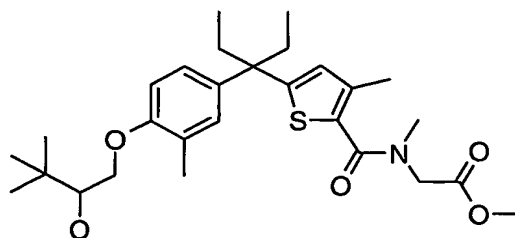
Using a procedure analogous to Example 2, N-methyl-2-[(5-{1-[4-(3,3-
 5 Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-
 carbonyl)-methylamino]-acetic acid methyl ester (0.96 g, 1.92 mmol) gives the title
 compound (0.75 g, 1.49 mmol, 78%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.0 Hz, 6H),
 1.03 (s, 9H), 2.04-2.14 (m, 4H), 2.21 (s, 3H), 2.24 (s, 3H), 3.09 (s, 3H), 3.71 (dd, *J* =
 8.4, 2.6 Hz, 1H), 3.75 (s, 3H), 3.87 (t, *J* = 8.9 Hz, 1H), 4.10 (dd, *J* = 9.2, 2.6 Hz, 1H),
 10 4.20 (bs, 2H), 6.52 (s, 1H), 6.72 (d, *J* = 8.7 Hz, 1H), 7.00-7.07 (m, 2H). LC/MS
 (m/z): calcd for C₂₈H₄₂NO₅S (M+H)⁺: 504.7; found: 504.2.

15

Example 120 and 121

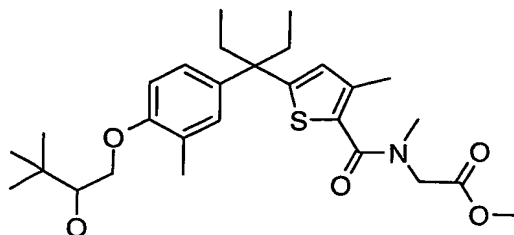
Preparation of enantiomers of N-methyl-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-
 butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-
 acetic acid methyl ester.

20



Enantiomer 1

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Enantiomer-2

A racemic mixture of N-methyl-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-
 5 butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-
 acetic acid methyl ester (740 mg) is chromatographed (CHIRALPAK AD column,
 40% *i*-PrOH/Hept) to give enantiomer 1 of the title compound (Example 120) (205
 mg, 28%) and enantiomer 2 of the title compound (Example 121) (179 mg, 24%).

10 Enantiomer 1, Example 120 :

rt = 7.1 m

NMR & LC/MS: Identical to the racemic material, Example 119.

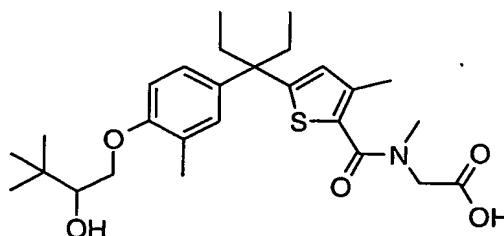
Enantiomer 2, Example 121 :

15 rt = 22.8 m

NMR & LC/MS: Identical to the racemic material, Example 119.

Example 122

Preparation of enantiomer 1 of N-methyl-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-
 20 dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-
 methylamino]-acetic acid.



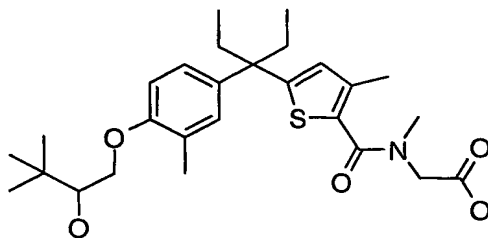
Enantiomer 1

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Using a procedure analogous to Example 47, enantiomer 1 of N-methyl-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid methyl ester (200 mg) yields the title compound (189 mg, 97%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 7.2 Hz, 6H), 1.02 (s, 9H), 2.01-2.13 (m, 4H), 2.20 (s, 3H), 2.24 (s, 3H), 3.12 (s, 3H), 3.72 (dd, *J* = 8.8, 2.7 Hz, 1H), 3.88 (t, *J* = 8.9 Hz, 1H), 4.12 (dd, *J* = 9.1, 2.7 Hz, 1H), 4.21 (s, 2H), 6.53 (s, 1H), 6.72 (d, *J* = 8.6 Hz, 1H), 7.00-7.06 (m, 2H). LC/MS (*m/z*): calcd for C₂₇H₄₀NO₅S (M+H)⁺: 490.7; found: 490.3.

10 Example 123

Preparation of enantiomer 2 of N-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid.



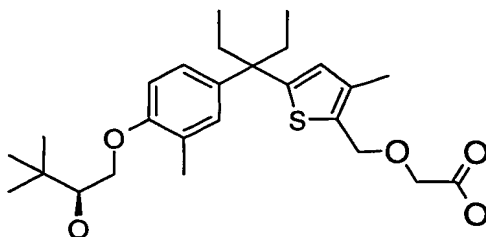
Enantiomer 2

Using a procedure analogous to Example 47, enantiomer 2 of N-methyl-2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-methylamino]-acetic acid methyl ester (172 mg, 0.34 mmol) yields the title compound (168.8mg, 98%). ¹H NMR and LC/MS (*m/z*): identical to Example 122.

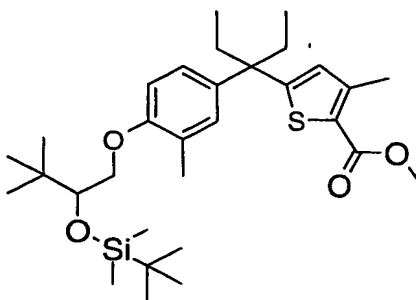
Example 124

Preparation of 2-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-yl-methoxy)acetic acid.

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A. 5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-carboxylic acid methyl ester.



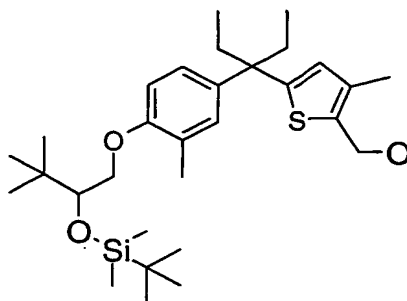
5

To a mixture of 5-(1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl)-3-methyl-thiophene-2-carboxylic acid methyl ester (Example 2) (1.15 g, 2.66 mmol), imidazole (0.27 g, 4.00 mmol), and DMF (15 mL) is added TBSCl (0.54 g, 2.80 mmol). The reaction is stirred for 24 h. The reaction is diluted with Et₂O (120 mL) and washed with 0.1 M HCl (3 x 40 ml). The organic layer is MgSO₄ dried and concentrated. The resulting residue is chromatographed to give the title compound (0.94 g, 64%). ¹H NMR (CDCl₃), δ 0.01 (s, 3H), 0.06 (s, 3H), 0.65 (t, *J* = 7.4 Hz, 6H), 0.85 (s, 9H), 0.91 (s, 9H), 2.00-2.14 (m, 4H), 2.14 (s, 3H), 2.43 (s, 3H), 3.67 (dd, *J* = 5.8, 3.4 Hz, 1H), 3.74 (s, 3H), 3.85 (dd, *J* = 9.8, 5.8 Hz, 1H), 3.98 (dd, *J* = 9.8, 3.4 Hz, 1H), 6.56 (s, 1H), 6.68 (d, *J* = 8.3 Hz, 1H), 6.96-7.03 (m, 2H). LC/MS (*m/z*): calcd for C₃₁H₅₁O₄SSi (*M*+H)⁺: 547.9; found: 547.2.

B. 5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophen-2-yl-methanol.

20

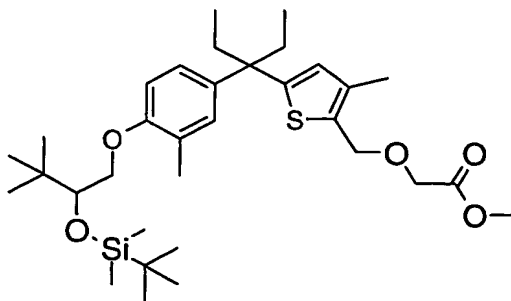
-266-



To a 0°C solution of 5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-carboxylic acid methyl ester (0.94 g, 1.71 mmol) and THF (50 mL) is added LAH (71 mg, 1.89 mmol).

- 5 The mixture is stirred for 10 m, warmed to RT and stirred for 2 h. The reaction is quenched with H₂O (70 ul), 15% NaOH (70 uL) and H₂O (210 uL) and diluted with EtOAc (50 mL). The mixture is filtered through diatomaceous earth and concentrated to give the title compound (0.89 g, 1.72 mmol, 100%). ¹H NMR (CDCl₃), δ 0.07 (s, 3H), 0.12 (s, 3H), 0.72 (t, *J* = 7.4 Hz, 6H), 0.91 (s, 9H), 0.98 (s, 9H), 2.01-2.14 (m, 4H), 2.19 (s, 3H), 2.21 (s, 3H), 3.68 (dd, *J* = 5.3, 3.4 Hz, 1H), 3.86 (dd, *J* = 9.0, 5.3 Hz, 1H), 3.98 (dd, *J* = 9.0, 3.4 Hz, 1H), 4.67 (s, 2H), 6.54 (s, 1H), 6.67 (d, *J* = 8.1 Hz, 1H), 7.00-7.06 (m, 2H). LC/MS (*m/z*): calcd for C₃₀H₅₀O₃SSi M⁺: 518.9; found: 518.0.

- 15 C. 2-[5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophen-2-ylmethoxy]-acetic acid methyl ester.

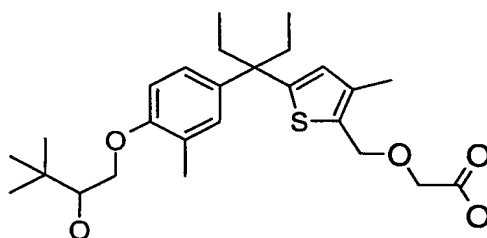


- 20 To a 0 °C solution of 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophen-2-yl-methanol (0.96 g, 1.85 mmol) in THF (10 mL) is added 60% NaH (81 mg, 2.0 mmol) and stirred for 20

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m. The mixture is added methyl bromoacetate (0.21 mL, 2.22 mmol) warmed to RT, and stirred overnight. The reaction is quenched with satd NH_4Cl (10 mL), diluted with H_2O (10 mL), and extracted with EtOAc (2 x 20 mL). The combined organic layers is MgSO_4 dried and concentrated. The resulting residue is chromatographed to give the title compound (0.33 g, 0.57 mmol, 31%). ^1H NMR (CDCl_3), δ 0.06 (s, 3H), 0.12 (s, 3H), 0.70 (t, $J = 7.3$ Hz, 6H), 0.91 (s, 9H), 0.97 (s, 9H), 2.01-2.10 (m, 4H), 2.19 (s, 3H), 2.20 (s, 3H), 3.67 (dd, $J = 5.8, 3.4$ Hz, 1H), 3.76 (s, 3H), 3.85 (dd, $J = 9.8, 5.8$ Hz, 1H), 3.98 (dd, $J = 9.8, 3.4$ Hz, 1H), 4.09 (s, 2H), 4.64 (s, 2H), 6.53 (s, 1H), 6.67 (d, $J = 8.3$ Hz, 1H), 7.00-7.06 (m, 2H). LC/MS (m/z): calcd for $\text{C}_{33}\text{H}_{58}\text{NO}_5\text{SSi}$ ($\text{M} + \text{NH}_4$) $^+$: 608.9; found: 608.3.

D. 2-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-yl-methoxy)-acetic acid.



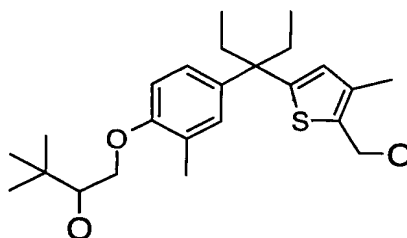
A solution of 2-[5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophen-2-ylmethoxy]-acetic acid methyl ester (0.33 g, 0.57 mmol), 1.0 M TBAF/THF (0.62 mL, 0.62 mmol) and THF (4 mL) is refluxed for 3h. The mixture filtered through silica gel, washed with EtOAc and concentrated. The resulting residue is hydrolyzed using a procedure analogous to Example 47 to give the title compound (0.13 g, 0.28 mmol) in an overall yield of 49%. ^1H NMR (CDCl_3), δ 0.71 (t, $J = 7.4$ Hz, 6H), 1.02 (s, 9H), 2.01-2.10 (m, 4H), 2.19 (s, 3H), 2.20 (s, 3H), 2.21 (bs, 2H), 3.72 (dd, $J = 8.8, 2.9$ Hz, 1H), 3.87 (t, $J = 8.8$ Hz, 1H), 4.08-4.12 (m, 2H), 4.16 (s, 1H), 4.66 (s, 1H), 5.24 (s, 1H), 6.54 (d, $J = 3.4$ Hz, 1H), 6.62 (d, $J = 8.3$ Hz, 1H), 7.01-7.08 (m, 2H). LC/MS (m/z): calcd for $\text{C}_{26}\text{H}_{37}\text{O}_5\text{S}$ ($\text{M} - \text{H}$) $^-$: 461.7; found: 461.2.

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Example 125

Preparation of 1-{4-[1-ethyl-1-(5-hydroxymethyl-4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol.

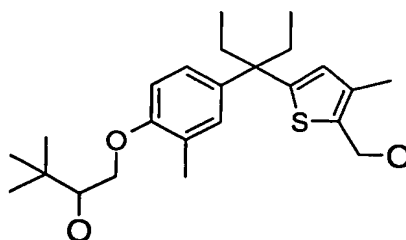
5



A solution of 1-{4-[1-ethyl-1-(5-hydroxymethyl-4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol, Example B (71.5 mg, 0.14 mmol) in THF (3 mL) is treated with 1.0 M TBAF (0.15 mL, 0.15 mmol). The reaction is refluxed for 14 h, diluted with EtOAc (20 mL), washed with H₂O (10 mL), MgSO₄ dried, and concentrated. The resulting residue is chromatographed to give the title compound (41.1 mg, 0.10 mmol, 71%). ¹H NMR (CDCl₃), δ 0.71 (t, *J* = 6.8 Hz, 6H), 1.02 (s, 9H), 2.02-2.11 (m, 4H), 2.19 (s, 3H), 2.21 (s, 3H), 2.44 (d, *J* = 2.9 Hz, 1H), 3.71 (dt, *J* = 8.9, 2.4 Hz, 1H), 3.87 (t, *J* = 8.9 Hz, 1H), 4.10 (dd, *J* = 8.9, 2.4 Hz, 1H), 4.66 (d, *J* = 5.4 Hz, 2H), 6.53 (s, 1H), 6.72 (d, *J* = 8.3 Hz, 1H), 7.02-7.08 (m, 2H). LC/MS (*m/z*): calcd for C₂₄H₃₆NaO₃S (M+Na)⁺: 427.6; found: 427.2.

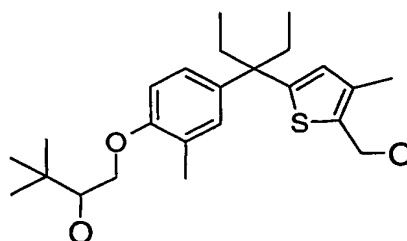
20 Example 126 and 127

Preparation of enantiomers of 1-{4-[1-ethyl-1-(5-hydroxymethyl-4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol.



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Enantiomer 1



Enantiomer 2

A racemic mixture of 1-{4-[1-ethyl-1-(5-hydroxymethyl-4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol (37.5 mg) is chromatographed (CHIRALPAK AD column, 40% *i*-PrOH/Hept) to give enantiomer 1 of the title compound, Example 126 (3.6 mg, 10%) and enantiomer 2 of the title compound, Example 127 (2.8 mg, 7%).

Example 126, Enantiomer 1

$$r_t = 5.3 \text{ m}$$

NMR & LC/MS: Identical to the racemic material, Example 125.

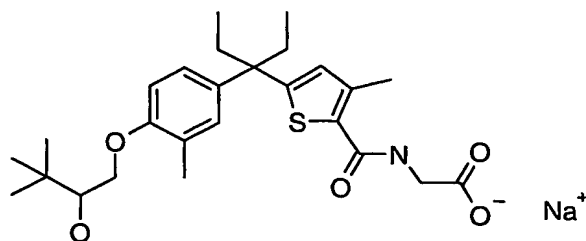
Example 127, Enantiomer 2

$$r_t = 8.5 \text{ m}$$

NMR & LC/MS: Identical to the racemic material, Example 125.

Example 128

Preparation of sodium salt of enantiomer 1 of 2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid.



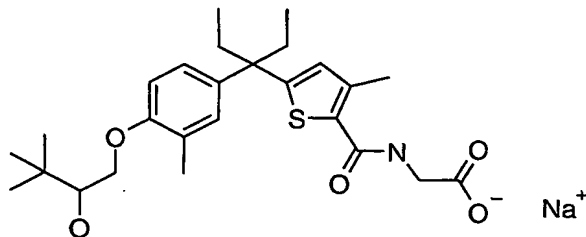
Enantiomer 1

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A solution of enantiomer 1 of 2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid, Example 48 (597 mg, 1.26 mmol) in CH₃OH (5 mL) is treated with 0.5 M NaOCH₃ (2.7 mL, 1.4 mmol) and stirred for 5 m. The mixture is concentrated to give the title compound (626 mg, 1.26 mmol, 100%). ¹H NMR (CD₃OD), δ 0.75 (t, *J* = 7.1 Hz, 6H), 1.05 (s, 9H), 2.10-2.20 (m, 4H), 2.23 (s, 3H), 2.50 (s, 3H), 3.66 (dd, *J* = 7.9, 3.0 Hz, 1H), 3.89 (s, 2H), 3.90-3.95 (m, 1H), 4.16 (dd, *J* = 10.1, 3.0 Hz, 1H), 6.72 (s, 1H), 6.83 (d, *J* = 8.8 Hz, 1H), 7.02-7.12 (m, 2H). LC/MS (*m/z*): calcd for C₂₆H₃₈NO₅S (M+H)⁺: 476.2; found: 476.2

Example 129

Preparation of sodium salt of enantiomer 2 of [(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid.



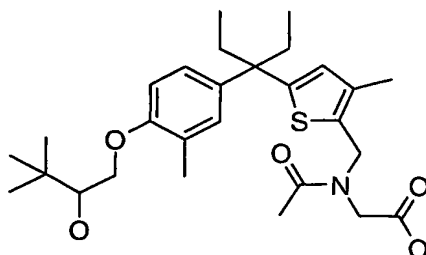
Enantiomer 2

Using a procedure analogous to Example 128, enantiomer 2 of 2-[(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid (Example 49) (0.69 g, 1.15 mmol) gives the title compound (0.69 g, 1.15 mmol, 100%). ¹H NMR and LC/MS: identical to Example 128.

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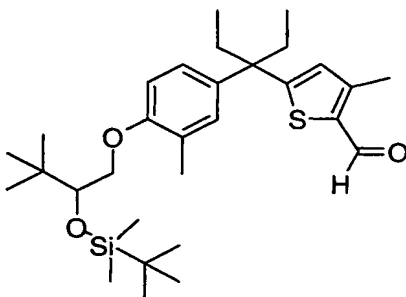
Example 130

Preparation of 2-[N-acetyl-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-ylmethyl)-amino]-acetic acid.



5

A. Preparation of 5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-carbaldehyde.



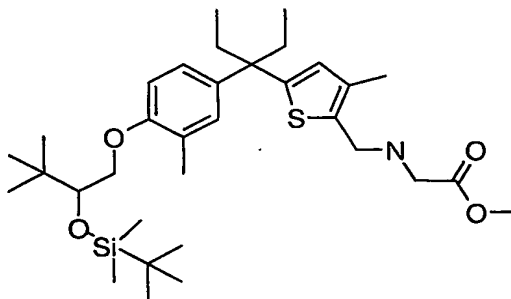
10

Using a procedure analogous to Example 41, 1-{4-[1-ethyl-1-(5-hydroxymethyl-4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol (Example 124B) (0.88 g, 1.69 mmol) gives the title compound (0.77 g, 1.49 mmol, 88%). ¹H NMR (CDCl₃), δ 0.07 (s, 3H), 0.12 (s, 3H), 0.72 (t, J = 7.4 Hz, 6H), 0.91 (s, 9H), 0.98 (s, 9H), 2.12 (q, J = 7.4 Hz, 4H), 2.21 (s, 3H), 2.50 (s, 3H), 3.68 (dd, J = 5.4, 3.5 Hz, 1H), 3.86 (dd, J = 9.9, 5.4 Hz, 1H), 3.98 (dd, J = 9.9, 3.5 Hz, 1H), 6.64 (s, 1H), 6.68 (d, J = 8.7 Hz, 1H), 6.95-7.03 (m, 2H), 9.92 (s, 1H). LC/MS (m/z): calcd for C₃₀H₄₉O₃SSi (M+H)⁺: 517.9; found: 517.2

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B. 2-([5-(1-(4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl)-1-ethyl-propyl)-3-methyl-thiophen-2-ylmethyl]-amino)-acetic acid methyl ester.



5

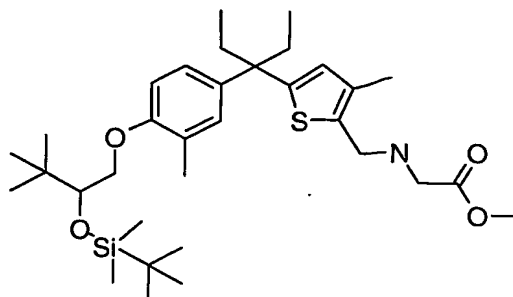
A mixture of 5-(1-(4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl)-1-ethyl-propyl)-3-methyl-thiophene-2-carbaldehyde (2.11 g, 4.09 mmol) and glycine methyl ester hydrochloride (0.56 g, 4.50 mmol) with Et₃N (0.74 mL, 5.3 mmol) is treated with Ti(Oi-Pr)₄ (1.6 mL, 5.3 mmol) at RT for 1 h. It is diluted with CH₃OH (20 mL), treated with NaB(CN)H₃ (282 mg, 4.5 mmol). The reaction is stirred overnight. It is then quenched with H₂O (3 mL) and stirred at RT for 1h, and filtered through silica gel washed with EtOAc (100 mL) and concentrated. Chromatographic purification gives the title compound (1.54 g, 2.61 mmol, 64%).

¹H NMR (CDCl₃), δ 0.06 (s, 3H), 0.12 (s, 3H), 0.70 (t, *J* = 6.9 Hz, 6H), 0.91 (s, 9H), 0.97 (s, 9H), 2.02-2.10 (m, 4H), 2.13 (s, 3H), 2.20 (s, 3H), 3.45 (s, 2H), 3.67 (dd, *J* = 5.4, 3.4 Hz, 1H), 3.73 (s, 3H), 3.82-3.87 (m, 3H), 3.98 (dd, *J* = 9.6, 3.4 Hz, 1H), 6.49 (s, 1H), 6.67 (d, *J* = 8.3 Hz, 1H), 7.00-7.05 (m, 2H). LC/MS (*m/z*): calcd for C₃₃H₅₅NO₄SSi (M)⁺: 589.9; found: 589.0.

C. 2-([5-(1-(4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl)-1-ethyl-propyl)-3-methyl-thiophen-2-ylmethyl]-amino)-acetic acid methyl ester.

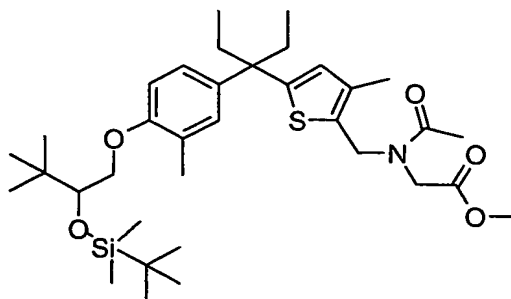
25

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Using a procedure analogous to Example 41, 5-(1-{4-[2-(tert-Butyl-dimethyl-
 5 silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-
 2-carbaldehyde (additional example Lu-13-A) (2.11 g, 4.09 mmol) and glycine methyl ester
 hydrochloride (0.56 g, 4.50 mmol) give the title compound (1.54 g, 2.61 mmol, 64%).
 %). ^1H NMR (CDCl_3), δ 0.06 (s, 3H), 0.12 (s, 3H), 0.70 (t, $J = 6.9$ Hz, 6H), 0.91 (s, 9H),
 0.97 (s, 9H), 2.02-2.10 (m, 4H), 2.13 (s, 3H), 2.20 (s, 3H), 3.45 (s, 2H), 3.67 (dd, $J = 5.4$,
 10 3.4 Hz, 1H), 3.73 (s, 3H), 3.82-3.87 (m, 3H), 3.98 (dd, $J = 9.6$, 3.4 Hz, 1H), 6.49 (s, 1H),
 6.67 (d, $J = 8.3$ Hz, 1H), 7.00-7.05 (m, 2H). LC/MS (m/z): calcd for $\text{C}_{33}\text{H}_{55}\text{NO}_4\text{Si}$
 (M) $^+$: 589.9; found: 589.0.

D. 2-{N-Acetyl-[5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-
 15 butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophen-2-ylmethyl]-amino}-acetic
 acid methyl ester.



20 To a 0°C solution of 2-{[5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-
 dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophen-2-ylmethyl]-

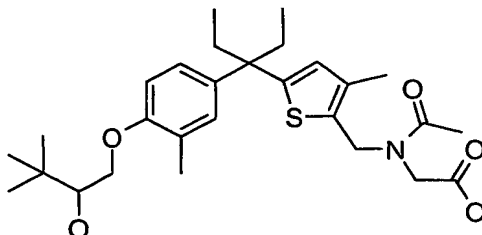
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amino}-acetic acid methyl ester (1.54 g, 2.61 mmol) in CH_2Cl_2 (10 mL) is added acetyl chloride (0.20 mL, 2.88 mmol). The reaction is stirred at RT for 1 h, diluted with CH_2Cl_2 (100 mL), washed with 1.0 M HCl (2 x 30 mL), H_2O (25 mL); Na_2SO_4 dried, and concentrated. The resulting residue is chromatographed to give the title compound (1.32

5 g, 2.09 mmol, 80%). ^1H NMR (CDCl_3), δ 0.06 (s, 3H), 0.12 (s, 3H), 0.69 (t, $J = 7.1$ Hz, 6H), 0.91 (s, 9H), 0.97 (s, 9H), 2.00-2.05 (m, 4H), 2.06 (s, 3H), 2.07 (s, 1.11 H), 2.10 (s, 1.89 H), 2.21 (s, 1.89 H), 2.24 (s, 1.11 H), 3.66-3.71 (m, 4H), 3.83-3.89 (m, 1H), 3.95 (s, 0.74 H), 3.96-4.01 (m, 1H), 4.04 (1.26 H), 4.60 (1.26H), 4.68 (0.74H), 6.49 (s, 0.37H), 6.51 (s, 0.63H), 6.65-6.69 (m, 1H), 6.97-7.03 (m, 2H). LC/MS (m/z): calcd for $\text{C}_{35}\text{H}_{58}\text{NO}_5\text{SSi}$ ($\text{M}+\text{H}$) $^+$: 632.4; found: 632.3.

10

E. 2-[N-Acetyl-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-ylmethyl)-amino]-acetic acid.



15

Using a procedure analogous to Example 124D, 2-[N-Acetyl-[5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophen-2-ylmethyl]-amino]-acetic acid methyl ester (1.32 g, 2.09 mmol) gives the title compound (0.95 g, 1.83 mmol, 88%). ^1H NMR (CD_3OD), δ 0.72 (t, $J = 7.3$ Hz, 3H), 0.73 (t, $J = 7.3$ Hz, 3H), 1.05 (s, 9H), 2.03 (s, 3H), 2.05-2.14 (m, 4H), 2.16 (s, 1.5H), 2.18 (s, 1.5 H), 2.22 (s, 1.5 H), 2.24 (s, 1.5 H), 3.66 (dd, $J = 7.6, 2.7$ Hz, 1H), 3.91 (dd, $J = 10.1, 7.6$ Hz, 1H), 3.98 (s, 1H), 4.03 (s, 1H), 4.16 (dd, $J = 10.1, 2.7$ Hz, 1H), 4.67 (s, 1H), 4.71 (s, 1H), 6.59 (s, 0.5H), 6.63 (s, 0.5H), 6.80 (d, $J = 3.1$ Hz, 0.5H), 6.82 (d, $J = 2.7$ Hz, 0.5H), 7.01-7.10 (m, 2H). LC/MS (m/z): calcd for $\text{C}_{28}\text{H}_{40}\text{NO}_5\text{SSi}$ ($\text{M}-\text{H}$) $^-$: 502.7; found: 502.2.

20

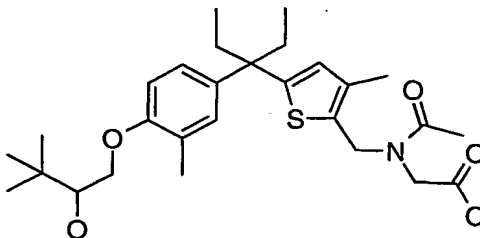
25

Example 131 and 132

Preparation of enantiomers of 2-[N-Acetyl-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-

-275-

butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-ylmethyl)-amino]-acetic acid.



Enantiomer 1

5

Enantiomer 2

A racemic mixture of 2-[N-acetyl-5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-ylmethyl)-amino]-acetic acid (560 mg) is chromatographed (CHIRALPAK AD, 0.1% TFA in *i*-PrOH/MeOH/Hept (20/5/75),) to give fraction-1 (338 mg, *rt* = 6.4 m), and fraction- 2, (343 mg, *rt* = 13.7 m). Fraction-1 is chromatographed to give the low *R_f* component (TLC: (EtOAc/CH₃OH/HOAc, 85/15/0.5; *R_f* = 0.5). The low *R_f* component is dissolved in CH₃OH (5mL), treated with 0.5 M NaOCH₃ (1.2 ml, 0.59 mmol), and stirred at RT for 10 m. The reaction is concentrated and partitioned between 1.0 M HCl (2 ml)/H₂O (10 ml)/EtOAc (3 x 15 ml). The organic layer is MgSO₄ dried and concentrated to give the enantiomer 1 of the title compound (Example 131) (153.7 mg, 27%).

15

20

Fraction-2 from the chiral resolution is manipulated as described for fraction-1 to give the enantiomer 2 of the title compound (Example 132) (149.9 mg, 27%).

Example 131, Enantiomer 1 CHIRALPAK AD, 0.1% TFA in *i*-PrOH/MeOH/Hept (20/5/75); *rt* = 6.4 m.

NMR & LC/MS: identical to the racemic material, Example 130.

25

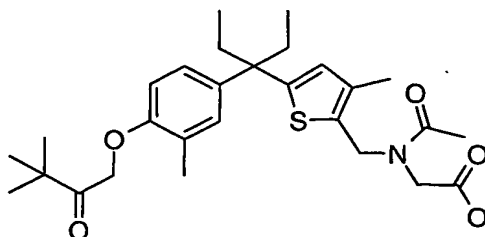
Example 132, Enantiomer 2 CHIRALPAK AD, 0.1% TFA in *i*-PrOH/MeOH/Hept (20/5/75); *rt* = 13.7 m.

NMR & LC/MS: Identical to the racemic material, Example 130.

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Example 133

Preparation of 2-[N-Acetyl-(5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-yl-methyl)-amino]-acetic acid.



5

Using a procedure analogous to Example 50, from 2-[N-acetyl-(5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-yl-methyl)-amino]acetic acid, Example 130 (0.35 g, 0.70 mmol) and Dess-Martin reagent (0.33 g, 0.77 mmol) give the title compound (0.11 g, 0.22 mmol, 31%). ¹H NMR

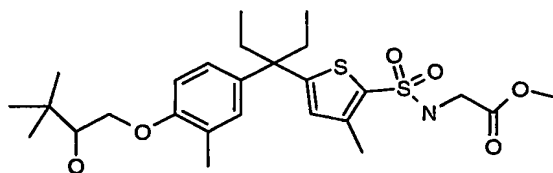
(CD₃OD), δ 0.72 (t, J = 7.6 Hz, 3H), 0.73 (t, J = 7.0 Hz, 3H), 1.29 (s, 9H), 2.04-2.14 (m, 7H), 2.16 (s, 1.5H), 2.18 (s, 1.5 H), 2.25 (s, 3 H), 3.97 (s, 1H), 4.01 (s, 1H), 4.68 (s, 1H), 4.71 (s, 1H), 5.03 (s, 1H), 5.04 (s, 1H), 6.59 (s, 1H), 6.66-6.67 (m, 1H), 7.00-7.08 (m, 2H).

LC/MS (m/z): calcd for C₂₈H₃₈NO₅SSi (M-H)⁻: 500.7; found: 500.3. δ

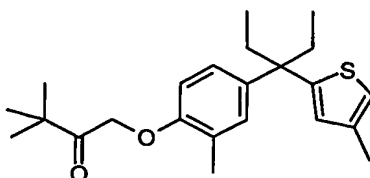
15

Example 134

Preparation of (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester.



20 A. 1-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-one.

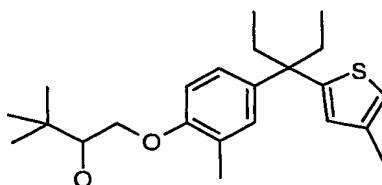


-277-

A mixture of 3'-[4-(hydroxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane (4.4 g, 16.4 mmol), 1-chloro-3,3-dimethyl-butan-2-one (2.37 ml, 18.1 mmol) and K₂CO₃ (3.39 g, 24.6 mmol) in acetone (40 ml) is refluxed overnight. After cooling, the reaction is filtered, concentrated and partitioned between EtOAc and 1N HCl. The organic phase is Na₂SO₄ dried and concentrated to give the title compound (6.2 g, quantitative).

¹H NMR (CDCl₃): δ 7.05 (d, 1H, J = 1.2 Hz), 7.02 (dd, 1H, J = 8.8, 2.4 Hz), 6.70 (s, 1H), 6.60 (d, 1H, J = 1.2 Hz), 6.52 (d, 1H, J = 8.8 Hz), 4.84 (s, 2H), 2.27 (s, 3H), 2.21 (s, 3H), 2.09 (q, 4H), 1.27 (s, 9H), 0.70 (t, 6H).

- 10 B. 1-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol

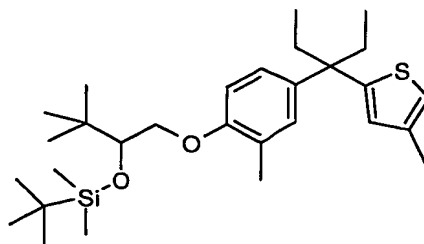


To a stirred solution of 1-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-one (5.2 g, 14 mmol) in THF/MeOH (40 ml/10 ml) at 0 °C is added NaBH₄ (528 mg, 14 mmol), warmed to RT, and stirred for 1 h. The reaction is concentrated and the residue is partitioned between EtOAc and 0.2 N HCl. The organic layer is MgSO₄ dried and concentrated to give the title compound (5.4 g, quantitative).

¹H NMR (CDCl₃): δ 7.05 (s, 2H), 6.73 (s, 1H), 6.70 (s, 1H), 6.60 (s, 1H), 4.09 (dd, 1H, J = 8.1, 2.4 Hz), 3.87 (dd, 1H, J = 8.1, 8.9 Hz), 3.70 (dd, 1H, J = 8.9, 2.4 Hz), 2.20 (s, 6H), 2.07 (q, 4H), 1.01 (s, 9H), 0.70 (t, 6H); ES-MS: 375 (M+1).

- 25 C. 1-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-2-(t-butyl)dimethylsilyloxy)-3,3-dimethyl-butane.

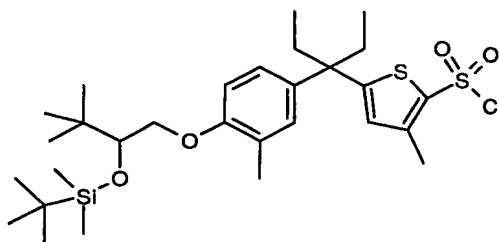
-278-



To a solution of 1-(4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy)-3,3-dimethyl-butan-2-ol (7.5 g, 20 mmol) in dichloromethane (100 ml) at -78°C is added 2,6-dimethylpyridine (5.8 ml, 50 mmol) followed by tert-butyldimethylsilyl trifluoromethanesulfonate (6.0 ml, 26 mmol). After stirring at RT for 2 h, the reaction
 5 diluted with dichloromethane and washed successively with 1N HCl followed by satd NaHCO_3 . The organic layer is dried over MgSO_4 and concentrated to give the title product (9.5 g, 97%).

^1H NMR (CDCl_3): δ 7.02, 7.06 (m, 2H), 6.61, 6.71 (m, 3H), 3.98 (dd, 1H, $J = 3.5, 9.9$
 10 Hz), 3.84 (dd, 1H, $J = 5.8, 9.9$ Hz), 3.66 (dd, 1H, $J = 3.5, 5.8$ Hz), 2.20 (s, 3H), 2.19 (s, 3H), 2.08 (q, 4H), 0.96 (s, 9H), 0.90 (s, 9H), 0.70 (t, 6H), 0.10 (s, 3H), 0.05 (s, 3H).

D. 5-(1-(4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl)-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonyl chloride.

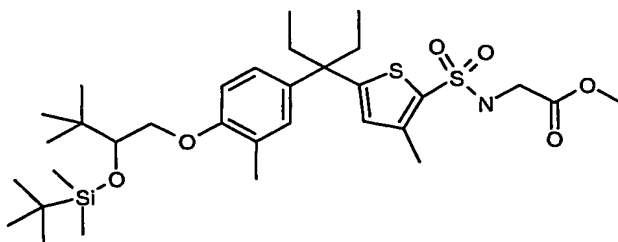


15

Add n-BuLi (6 ml, 9.6 mmol, 1.6 M/Hex) to a solution of 1-(4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy)-2-(t-butyldimethylsilyloxy)-3,3-dimethyl-butane (3.9 g, 8 mmol) in THF (20 ml) at 0°C . After 1 h, the mixture is transferred through cannula into a solution of SO_2Cl_2 (0.65 ml, 8 mmol) in pentane (30
 20 ml) at -78°C . It is stirred at RT for 2 h and concentrated. The residue is dissolved in dichloromethane (20 ml) and used for the next reaction without further purification.

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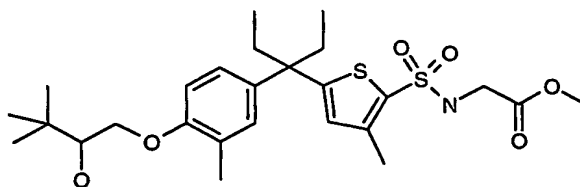
- E. [5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonylamine]-acetic acid methyl ester.



- 5 An aliquot of 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonyl chloride (step D) (4 ml, 1.5 mmol) is added to a suspension of glycine methyl ester hydrochloride (565 mg, 4.5 mmol) and Et₃N (0.94 ml, 6.75 mmol) in dichloromethane (10 ml) at 0 °C. It is stirred at RT overnight, concentrated, and partitioned between EtOAc and 1N HCl. The organic
10 layer is concentrated and chromatographed (Hex to 20% EtOAc/Hex) to give the title product (380 mg, 40%).

- ¹H NMR (CDCl₃): δ 7.01 (dd, 1H, J = 2.0, 8.3 Hz), 6.97 (d, 1H, J = 2.0 Hz), 6.68 (d, 1H, J = 8.3 Hz), 6.59 (s, 1H), 5.10 (t, 1H), 3.98 (dd, 1H, J = 3.5, 9.9 Hz), 3.84, 3.88 (m, 3H), 3.65, 3.69 (m, 4H), 2.41 (s, 3H), 2.20 (s, 3H), 2.09 (q, 4H), 0.97 (s, 9H), 0.90 (s, 9H), 0.70
15 (t, 6H), 0.11 (s, 3H), 0.05 (s, 3H);
ES-MS: 640 (M+1).

- F. (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester.



20

- To a solution of [5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonylamine]-acetic acid methyl ester (380 mg, 0.59 mmol) in acetonitrile (10 ml) at 0 °C is added hydrofluoride solution (3 ml, 48% in water). After stirring at RT for 2 h, the reaction is

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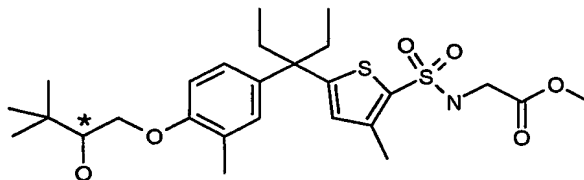
concentrated and partitioned between EtOAc and 1N HCl. The organic layer is washed successively with 1N HCl and brine. The organic layer is concentrated and chromatographed (Hex to 25% EtOAc/Hex) to give the title compound (250 mg, 82%).

^1H NMR (CDCl_3): δ 7.02 (dd, 1H, $J = 2.5, 8.3$ Hz), 6.97 (d, 1H, $J = 2.0$ Hz), 6.73 (d, 1H, $J = 8.3$ Hz), 6.58 (s, 1H), 5.12 (t, 1H), 4.10 (dd, 1H, $J = 2.5, 8.6$ Hz), 3.87 (dd, 1H, $J = 8.6, 8.8$ Hz), 3.84 (d, 2H, $J = 5.3$ Hz), 3.71 (dd, 1H, $J = 2.5, 8.8$ Hz), 3.66 (s, 3H), 2.40 (s, 3H), 2.20 (s, 3H), 2.07 (q, 4H), 1.02 (s, 9H), 0.69 (t, 6H);

HRMS: Calcd. for $\text{C}_{26}\text{H}_{43}\text{N}_2\text{O}_6\text{S}_2$ ($M+18$), 543.2563, found, 543.2550.

10 Example 135 and Example 136

Preparation of enantiomers of (5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester.



A racemic mixture of (5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester (750 mg) is chromatographed on Chiralpak AD column to give enantiomer 1, Example 135 (400 mg, 53%) and enantiomer 2, Example 136 (320 mg, 43%).

HPLC: Chiralpak AD (4.6 x 150 mm); 35% heptane, 65% EtOH; flow rate: 0.6 ml/m; UV: 260 nm

20 Enantiomer 1, Example 135: $r_t = 4.5$ m;

^1H NMR (CDCl_3): equivalent to Example 134

Enantiomer 2, equivalent to Example 136: $r_t = 5.6$ m.

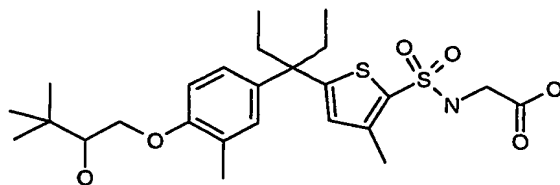
^1H NMR (CDCl_3): equivalent to Example 134

25

Example 137

Preparation of (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid.

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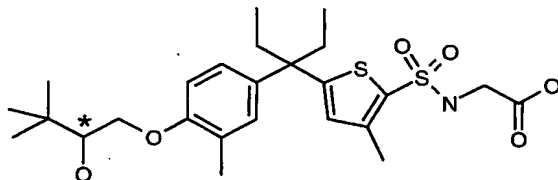
To a solution of (5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester (210 mg, 0.4 mmol) in dioxane (10 ml) is added 2N LiOH/H₂O solution (10 ml) and stirred at RT overnight. The reaction is concentrated and partitioned between EtOAc/1N HCl. The organic layer is concentrated to give the title compound (180 mg, 88%).

¹H NMR (CDCl₃): δ 7.01 (dd, 1H, J = 2.5, 8.3 Hz), 6.97 (d, 1H, J = 2.0 Hz), 6.73 (d, 1H, J = 8.3 Hz), 6.60 (s, 1H), 5.16 (t, 1H), 4.12 (dd, 1H, J = 2.9, 9.3 Hz), 3.88 (dd, 1H, J = 8.8, 9.3 Hz), 3.86 (d, 2H, J = 5.5 Hz), 3.72 (dd, 1H, J = 2.9, 8.8 Hz), 2.40 (s, 3H), 2.20 (s, 3H), 2.05 (q, 4H), 1.01 (s, 9H), 0.70 (t, 6H);

HRMS: Calcd. for C₂₅H₃₈NO₆S₂ (M+1), 512.2146, found, 512.2141.

Example 138

Preparation of enantiomers of (5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid.



Using a procedure analogous to Example 136, enantiomer 1 of (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester (390 mg, 0.74 mmol) (Example 135) gives the title compound (250 mg, 66%).

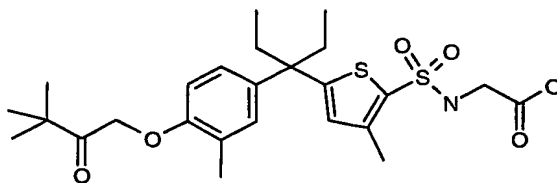
¹H NMR (CDCl₃): equivalent to Example 134;

ES-MS: 512 (M+1).

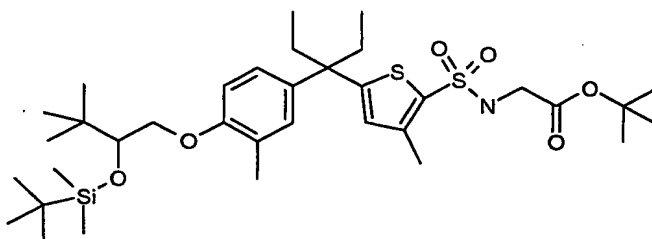
Example 139

Preparation of (5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid.

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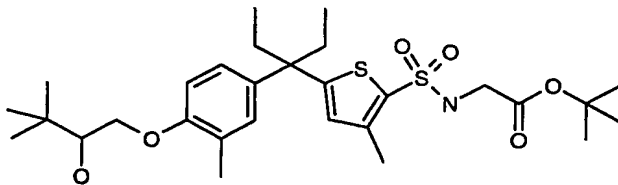
A. [5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonylamine]-acetic acid tert-butyl ester.



Using a procedure analogous to Example 134E, 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonyl chloride and 2-amino-acetic acid tert-butyl ester (787 mg, 6 mmol) give the title compound (670 mg, 20%).

¹H NMR (CDCl₃): δ 7.01 (dd, 1H, J = 2.5, 8.8 Hz), 6.97 (d, 1H, J = 2.0 Hz), 6.68 (d, 1H, J = 8.8 Hz), 6.57 (s, 1H), 5.09 (t, 1H), 3.98 (dd, 1H, J = 3.5, 9.8 Hz), 3.86 (dd, 1H, J = 5.9, 9.8 Hz), 3.71 (d, 2H, J = 5.4 Hz), 3.67 (dd, 1H, J = 3.5, 5.9 Hz), 2.40 (s, 3H), 2.20 (s, 3H), 2.08 (q, 4H), 1.40 (s, 9H), 0.97 (s, 9H), 0.90 (s, 9H), 0.70 (t, 6H), 0.11 (s, 3H), 0.05 (s, 3H).

B. (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid tert-butyl ester.



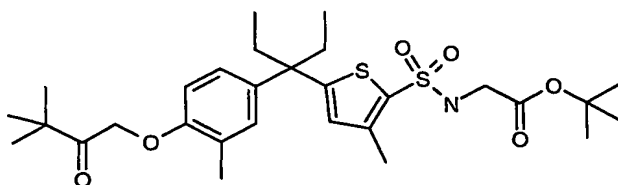
A mixture of [5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonylamine]-acetic acid tert-

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butyl ester (667 mg, 1mmol) and tetra-n-butylammonium fluoride (6 ml, 1M in THF) is stirred at RT for 3 d. It is diluted with EtOAc and washed with NH₄Cl. The organic layer is concentrated and chromatographed (Hex to 15% EtOAc/Hex) to give the title compound (360 mg, 63%).

5 ES-MS: 568 (M+1).

C. (5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid tert-butyl ester.

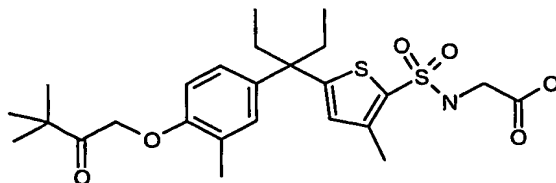


10 A mixture of (5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid tert-butyl ester (360 mg, 0.63 mmol), pyridinium dichromate (179 mg, 0.48 mmol) and Ac₂O (66 μ L, 0.7 mmol) in dichloromethane (10 ml) is refluxed for 3 h. The reaction is concentrated and chromatographed (Hex to 15% EtOAc/Hex) to give the title compound (330 mg, 92%);

15 ¹H NMR (CDCl₃): δ 6.96, 7.23 (m, 2H), 6.56 (s, 1H), 6.51 (d, 1H, J = 8.3 Hz), 6.57 (s, 1H), 5.08 (t, 1H), 4.85 (s, 2H), 3.71 (d, 2H, J = 5.4 Hz), 2.40 (s, 3H), 2.26 (s, 3H), 2.07 (q, 4H), 1.40 (s, 9H), 1.26 (s, 9H), 0.90 (s, 9H), 0.70 (t, 6H);

HRMS: calcd. for C₂₉H₄₇N₂O₆S₂ (M+18), 583.2876, found, 583.2876.

20 D. (5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid.



A solution of (5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid tert-butyl ester (320 mg, 0.57 mmol) in 4N HCl/dioxane (10 ml) is stirred at RT overnight. The reaction is concentrated

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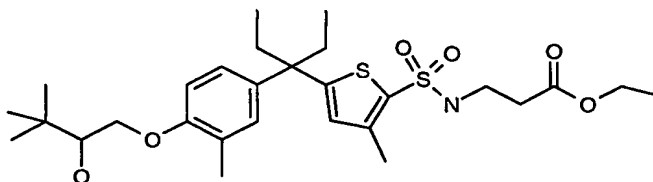
and chromatographed (Hex to 0.5% AcOH in 50% EtOAc/Hex) to give the title compound (250 mg, 87%).

^1H NMR (CDCl_3): δ 7.01 (d, 1H, $J = 2.5$ Hz), 6.92 (dd, 1H, $J = 2.5, 8.8$ Hz), 6.62 (s, 1H), 6.45 (d, 1H, $J = 8.8$ Hz), 5.10 (t, 1H), 4.91 (s, 2H), 3.86 (d, 2H, $J = 5.4$ Hz), 2.41 (s, 3H), 2.25 (s, 3H), 2.04 (q, 4H), 1.25 (s, 9H), 0.71 (t, 6H);

HRMS: Calcd. for $\text{C}_{25}\text{H}_{39}\text{N}_2\text{O}_6\text{S}_2$ ($M+18$), 527.2250, found, 527.2245.

Example 140

Preparation of 3-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid ethyl ester.



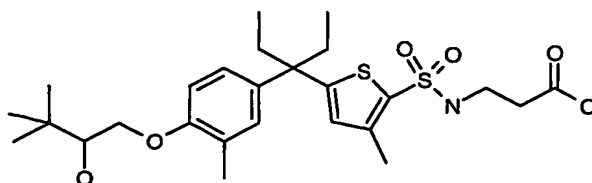
Using procedures analogous to Example 134E and Example 134F, an aliquot of 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonyl chloride (Example 134D) and 3-amino-propionic acid ethyl ester hydrochloride give the title compound (19% overall yield).

^1H NMR (CDCl_3): δ 7.02 (dd, 1H, $J = 2.5, 8.8$ Hz), 6.98 (d, 1H, $J = 2.0$ Hz), 6.73 (d, 1H, $J = 8.8$ Hz), 6.58 (s, 1H), 5.26 (t, 1H), 4.14 (q, 2H), 4.10 (dd, 1H, $J = 2.9, 8.9$ Hz), 3.87 (dd, 1H, $J = 8.8, 8.9$ Hz), 3.71 (dd, 1H, $J = 2.9, 8.8$ Hz), 3.25 (m, 2H), 2.50 (t, 2H), 2.39 (s, 3H), 2.20 (s, 3H), 2.06 (q, 4H), 1.02 (s, 9H), 0.70 (t, 6H);

HRMS: Calcd. for $\text{C}_{28}\text{H}_{44}\text{NO}_6\text{S}_2$ ($M+1$), 554.2610, found, 554.2590.

Example 141

Preparation of 3-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid.



-285-

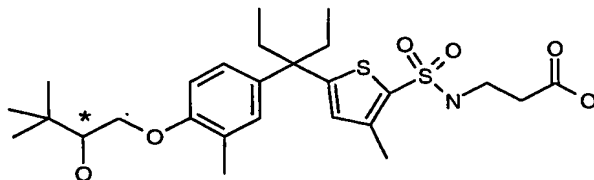
The title compound is obtained from 3-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid ethyl ester using an analogous procedure as described for Example 137.

¹H NMR (CDCl₃): δ 7.02 (d, 1H, J = 8.3 Hz), 6.98 (s, 1H), 6.73 (d, 1H, J = 8.3 Hz), 6.60 (s, 1H), 5.50 (t, 1H), 4.13 (d, 1H), 4.12 (dd, 1H, J = 2.0, 8.9 Hz), 3.88 (dd, 1H, J = 8.8, 8.9 Hz), 3.72 (dd, 1H, J = 2.0, 8.8 Hz), 3.26 (m, 2H), 2.55 (t, 2H), 2.39 (s, 3H), 2.20 (s, 3H), 2.06 (q, 4H), 1.02 (s, 9H), 0.70 (t, 6H);

HRMS: Calcd. for C₂₆H₄₀NO₆S₂ (M+1), 526.2297, found, 526.2275.

10 Example 142 and Example 143

Preparation of enantiomers of 3-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid.



15 A racemic mixture of 3-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid (200 mg) is chromatographed on a Chiralpak AD column to give enantiomer 1, example 142 (79 mg, 40%) and enantiomer 2, Example 143 (79 mg, 40%).

HPLC: Chiralpak AD (4.6 x 250 mm); 0.1% TFA in 15% EtOH/85% Hept; flow rate:

20 1.0 ml/m; UV: 260 nm

Enantiomer 1: rt = 12 m;

¹H NMR (CDCl₃): equivalent to Example 141;

ES-MS: 526 (M+1)

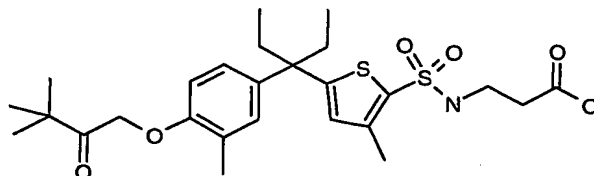
25 Enantiomer 2: rt = 21 m;

¹H NMR (CDCl₃): equivalent to Example 141;

ES-MS: 526 (M+1).

Example 144

Preparation of 3-(5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid.



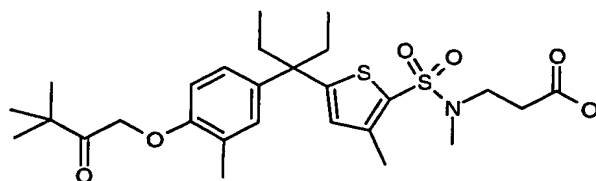
5 The title compound is obtained from 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonyl chloride and 2-amino-acetic acid tert-butyl ester and 3-amino-propionic acid t-butyl ester hydrochloride using an analogous procedures as described for Example 139A to Example 139D.

10 ¹H NMR (CDCl₃): δ 6.99 (s, 1H), 6.97 (d, 1H, J = 8.4 Hz), 6.59 (s, 1H), 6.50 (d, 1H, J = 8.4 Hz), 5.61 (t, 1H), 4.87 (s, 2H), 3.26 (m, 2H), 2.55 (t, 2H), 2.39 (s, 3H), 2.25 (s, 3H), 2.06 (q, 4H), 1.26 (s, 9H), 0.69 (t, 6H);
ES-MS: 524 (M+1).

15

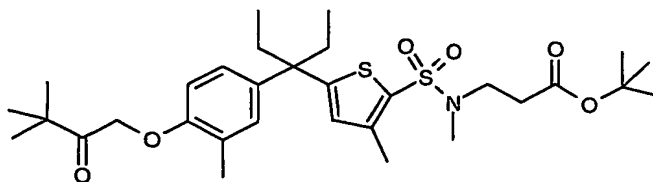
Example 145

Preparation of 3-[(5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonyl)-methyl-amine]-propionic acid.



20 A. 3-[(5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonyl)-methyl-amine]-propionic acid tert-butyl ester.

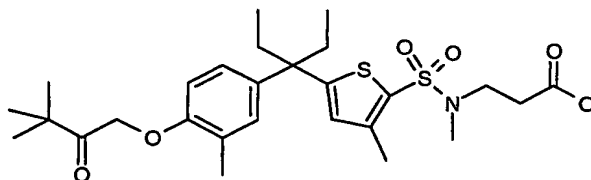
-287-



To a mixture of 3-(5-{1-[4-(3,3-dimethyl-2-oxobutoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonyl)-propionic acid tert-butyl ester (Example 143C) (400 mg, 0.69 mmol) and THF (15 ml) is added PPh₃ (272 mg, 1.04 mmol), diethyl azodicarboxylate (163 μ L, 1.04 mmol) and methanol (42 μ L, 1.04 mmol). The reaction is stirred at RT overnight, concentrated and chromatographed (Hex to 20% EtOAc/Hex) to give the title compound (240 mg, 59%).

¹H NMR (CDCl₃): δ 6.99 (s, 1H), 6.97 (d, 1H, J = 8.4 Hz), 6.57 (s, 1H), 6.52 (d, 1H, J = 8.4 Hz), 4.85 (s, 2H), 3.37 (t, 2H), 2.81 (s, 3H), 2.51 (t, 2H), 2.41 (s, 3H), 2.26 (s, 3H), 2.06 (q, 4H), 1.44 (s, 9H), 1.26 (s, 9H), 0.69 (t, 6H).

B. 3-[(5-{1-[4-(3,3-Dimethyl-2-oxobutoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonyl)-methyl-amine]-propionic acid.



The title compound is prepared from 3-[(5-{1-[4-(3,3-dimethyl-2-oxobutoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonyl)-methyl-amine]-propionic acid tert-butyl ester using a procedure analogous to Example 139D.

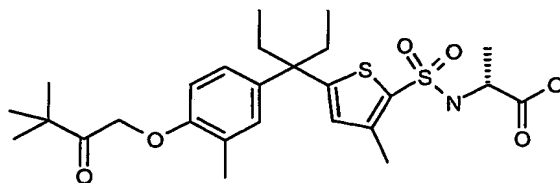
¹H NMR (CDCl₃): δ 6.99 (s, 1H), 6.97 (d, 1H, J = 8.4 Hz), 6.60 (s, 1H), 6.50 (d, 1H, J = 8.4 Hz), 4.87 (s, 2H), 3.41 (t, 2H), 2.84 (s, 3H), 2.63 (t, 2H), 2.41 (s, 3H), 2.26 (s, 3H), 2.06 (q, 4H), 1.26 (s, 9H), 0.69 (t, 6H).

HRMS: calcd. for C₂₇H₄₀NO₆S₂, 538.2297, found, 538.2296.

Example 146

2-(R)-(5-{1-[4-(3,3-Dimethyl-2-oxobutoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid.

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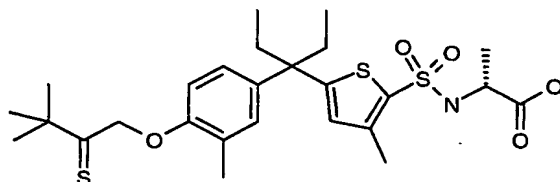


The title compound is prepared from 2-(R)-amino-propionic acid tert-butyl ester hydrochloride following an analogous procedure as described for Example 139.

¹H NMR (CDCl₃): δ 6.96 (d, 1H, J = 2.5 Hz), 6.97 (dd, 1H, J = 2.0, 8.8 Hz), 6.61 (s, 1H),
 5 6.44 (d, 1H, J = 8.5 Hz), 5.26 (d, 1H, J = 8.3 Hz), 4.92 (s, 2H), 4.11 (m, 1H), 2.40 (s, 3H),
 2.25 (s, 3H), 2.06 (q, 4H), 1.42 (d, 3H, J = 7.4 Hz), 1.25 (s, 9H), 0.69 (t, 6H);
 ES-MS: 524 (M+1).

Example 147

10 2-(R)-(5-{1-[4-(3,3-Dimethyl-2-thioxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid.



A mixture of 2-(R)-(5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid (125 mg, 0.2 mmol)
 15 and Lawesson's reagent (236 mg, 0.5 mmol) in dichloroethane (7 ml) is refluxed for 3 d. The solvent is concentrated and chromatographed (0.1% AcOH in 50% EtOAc/Hex) to give the title compound (67 mg, 52%).

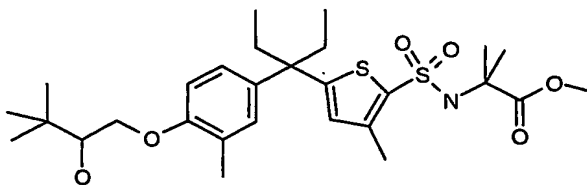
¹H NMR (CDCl₃): δ 6.97 (s, 1H), 6.96 (d, 1H, J = 8.4 Hz), 6.60 (s, 1H), 6.50 (d, 1H, J =
 8.4 Hz), 5.19 (d, 1H, J = 8.8 Hz), 4.86 (s, 2H), 4.14 (m, 1H), 2.40 (s, 3H), 2.25 (s, 3H),
 20 2.06 (m, 4H), 1.38 (d, 3H), 1.26 (s, 9H), 0.69 (t, 6H);

HRMS: calcd. for C₂₆H₃₈NO₅S₃, 540.1912, found, 540.1908.

Example 148

25 Preparation of 2-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-2-methyl-propionic acid methyl ester.

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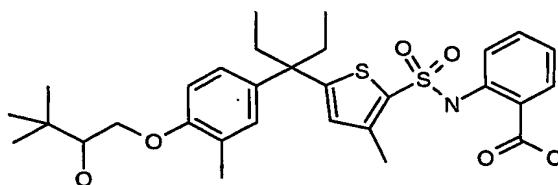
Using analogous procedures as described for Example 134D to Example 134F, 2-amino-2-methyl-propionic acid methyl ester hydrochloride gives the title compound (20% overall yield).

- 5 ^1H NMR (CDCl_3): δ 7.03 (dd, 1H, $J = 2.4, 8.4$ Hz), 6.96 (d, 1H, $J = 2.3$ Hz), 6.72 (d, 1H, $J = 8.8$ Hz), 6.53 (s, 1H), 5.42 (s, 1H), 4.10 (dd, 1H, $J = 2.6, 9.2$ Hz), 3.87 (dd, 1H, $J = 8.8, 9.2$ Hz), 3.69 (dd, 1H, $J = 2.6, 8.8$ Hz), 3.67 (s, 3H), 2.38 (s, 3H), 2.19 (s, 3H), 2.06 (q, 4H), 1.48 (s, 6H), 1.02 (s, 9H), 0.69 (t, 6H);
- HRMS: Calcd. for $\text{C}_{28}\text{H}_{44}\text{NO}_6\text{S}_2$ ($M+1$), 554.2610, found, 554.2610.

10

Example 149

Preparation of 2-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-benzoic acid.



- 15 Using analogous procedures as described for Example 134D to Example 134F and Example 137, 2-amino-benzoic acid methyl ester gives the title compound (8% overall yield).
- ^1NMR (400MHz, CDCl_3) δ 10.54 (s, 1H), 8.03 (d, 1H, $J=7.9$ Hz), 7.71 (d, 1H, $J=8.4$ Hz), 7.48 (t, 1H, $J=7.9$ Hz), 7.09 (t, 1H, $J=7.7$ Hz), 6.93 (dd, 1H, $J=8.6, 2.4$ Hz), 6.86 (s, 1H),
- 20 6.70 (d, 1H, $J=8.4$ Hz), 6.48 (s, 1H), 4.14-4.07 (m, 1H), 3.89 (t, 1H, $J=9.0$ Hz), 3.72 (dd, 1H, $J=8.6, 2.4$ Hz), 2.30 (s, 3H), 2.16 (s, 3H), 2.04-1.93 (m, 4H), 1.02 (s, 9H), 0.60 (t, 6H, $J=7.3$ Hz).

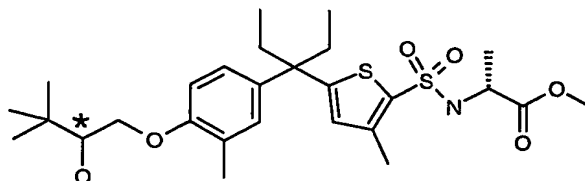
High Res. EI-MS: 574.2305; calc. for $\text{C}_{30}\text{H}_{39}\text{NO}_6\text{S}_2+\text{H}$: 574.2297

25

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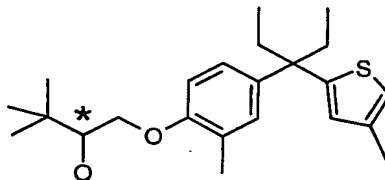
Example 150

Preparation of epimer 1 of 2-(R)-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid methyl ester.



5

A. Enantiomer 1 of 1-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol.



To a mixture of (R)-2-methyl-CBS-oxazaborolidine (0.1 ml, 0.1 mmol, 1M in
10 toluene), borane-N, N-dimethyl aniline complex (0.18 ml, 1 mmol) in THF (5 ml) is
added a solution of 1-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-
phenoxy}-3,3-dimethyl-butan-2-one (372 mg, 1 mmol) in THF (5 ml) over a period of
40 m. The reaction is stirred at RT for 2 h and MeOH (2 ml) is added followed by 1N
hydrochloric acid. The mixture is extracted with EtOAc and the organic phase is
15 concentrated and chromatographed (Hex to 25% EtOAc/Hex) to give the title
compound (305 mg, 82%).

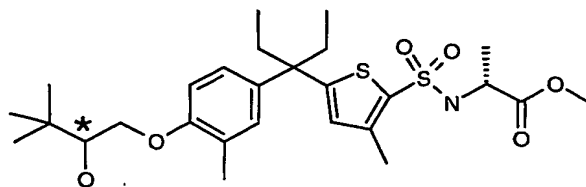
HPLC: Chiralpak AD (0.46 x 25 cm); 20% 2-propanol, 80% heptane; flow rate: 1.0
ml/m; UV: 225 nm;

Enantiomer 1: 91% ee; rt: 4.03 m.

20 ¹H NMR (CDCl₃) equivalent to Example 134B

B. Epimer 1 of 2-(R)-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-
phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid methyl ester

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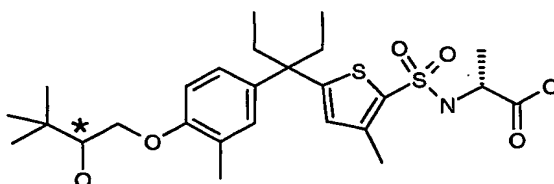
Using analogous procedures described in Example 134C to Example 134F, enantiomer 1 of 1-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol and 2-(R)-amino-propionic acid methyl ester hydrochloride give the title compound (27% overall yield).

¹NMR (400MHz, CDCl₃) δ 7.01 (d, 1H, J=8.4 Hz), 6.96 (s, 1H), 6.72 (d, 1H, J=8.4 Hz), 6.56 (s, 1H), 5.26 (d, 1H, J=8.8 Hz), 4.10-4.03 (m, 2H), 3.86 (t, 1H, J=9.0 Hz), 3.71 (dd, 1H, J=8.8, 2.2 Hz), 3.59 (s, 3H), 2.38 (s, 3H), 2.19 (s, 3H), 2.11-2.03 (m, 4H), 1.38 (d, 3H, J=7.0 Hz), 1.01 (s, 9H), 0.68 (t, 6H, J=7.3 Hz).

High Res. EI-MS: 540.24556; calc. for C₂₇H₄₁NO₆S₂+H: 540.2454

Example 151

Preparation of epimer 1 of 2-(R)-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid.



Using an analogous procedure to Example 137, epimer 1 of 2-(R)-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-propionic acid methyl ester (Example 150) gives the title compound (98%).

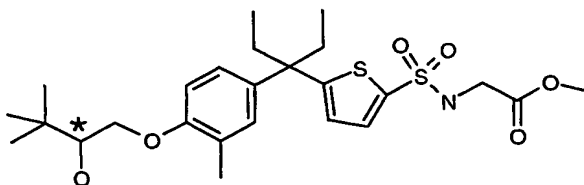
¹NMR (400MHz, CDCl₃) δ 7.04-6.98 (m, 1H), 6.96 (s, 1H), 6.73 (d, 1H, J=8.8 Hz), 6.59 (s, 1H), 5.29 (d, 1H, J=8.8 Hz), 4.14-4.07 (m, 2H), 3.88 (t, 1H, J=9.0 Hz), 3.74-3.69 (m, 1H), 2.38 (s, 3H), 2.19 (s, 3H), 2.12-2.01 (m, 4H), 1.41 (d, 3H, J=7.0 Hz), 1.01 (s, 9H), 0.69 (t, 6H, J=7.3 Hz).

High Res. EI-MS: 526.2284; calc. for C₂₆H₃₉NO₆S₂+H: 526.2297

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Example 152

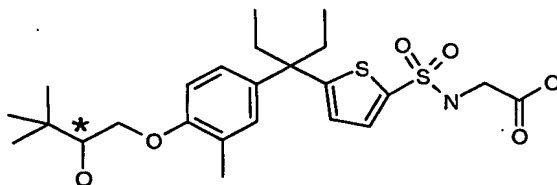
Preparation of enantiomer 1 of (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid methyl ester.



- 5 Using a procedure analogous to Example 150A, 1-[4-(1-ethyl-1-thiophen-2-yl-propyl)-2-methyl-phenoxy]-3,3-dimethyl-butan-2-one gives the title compound (18%).
¹H NMR (CDCl₃) δ 7.43 (d, 1H, J = 4.0 Hz), 7.02 (dd, 1H, J = 2.0, 8.5 Hz), 6.98 (s, 1H),
 6.74 (s, 1H), 6.73 (d, 1H, J = 8.8 Hz), 5.11 (t, 1H), 4.10 (dd, 1H, J = 2.6, 9.2 Hz), 3.88
 (dd, 1H, J = 8.8, 9.2 Hz), 3.85 (d, 2H, J = 4.8 Hz), 3.71 (dd, 1H, J = 2.6, 8.8 Hz), 3.66 (s,
 10 3H), 2.19 (s, 3H), 2.07 (m, 4H), 1.01 (s, 9H), 0.70 (t, 6H);
 HRMS: Calcd. for C₂₅H₄₁N₂O₆S₂ (M+18), 529.2406, found, 529.2413.

Example 153

- Preparation of enantiomer 1 of (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid.
 15 methyl-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid.

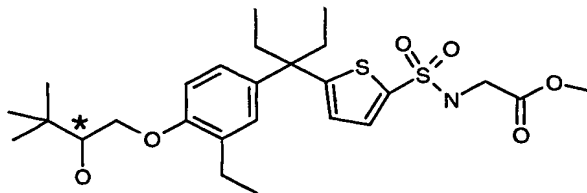


- Using an analogous procedure to Example 137, enantiomer 1 of (5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid methyl ester give the title compound (quant).
 20 ¹H NMR (CDCl₃) δ 7.44 (d, 1H, J = 4.0 Hz), 7.0 (d, 1H, J = 8.4 Hz), 6.98 (s, 1H), 6.78 (d,
 1H, J = 4.0 Hz), 6.74 (d, 1H, J = 8.4 Hz), 5.11 (t, 1H), 4.10 (dd, 1H, J = 2.5, 9.2 Hz), 3.88
 (dd, 1H, J = 8.8, 9.2 Hz), 3.85 (d, 2H, J = 4.4 Hz), 3.71 (dd, 1H, J = 2.5, 8.8 Hz), 2.19 (s,
 3H), 2.07 (m, 4H), 1.01 (s, 9H), 0.70 (t, 6H);
 HRMS: Calcd. for C₂₄H₃₉N₂O₆S₂ (M+18), 515.2249, found, 515.2267.

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Example 154

Preparation of enantiomer 1 of (5-{1-ethyl-1-[3-ethyl-4-(2-hydroxy-3,3-dimethyl-butoxy)-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid methyl ester.



Using a procedure analogous to Example 150A, 1-[2-ethyl-4-(1-ethyl-1-thiophen-2-yl-propyl)-phenoxy]-3,3-dimethyl-butan-2-one gives the title compound (34%).

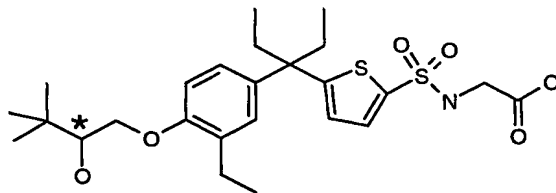
^1H NMR (CDCl_3) δ 7.43 (d, 1H, $J = 3.5$ Hz), 7.02 (d, 1H, $J = 8.3$ Hz), 7.00 (s, 1H), 6.76 (d, 1H, $J = 3.5$ Hz), 6.75 (d, 1H, $J = 8.3$ Hz), 5.06 (t, 1H), 4.10 (dd, 1H, $J = 2.6, 9.3$ Hz), 3.88 (dd, 1H, $J = 8.8, 9.3$ Hz), 3.85 (d, 2H, $J = 5.8$ Hz), 3.71 (dd, 1H, $J = 2.6, 8.8$ Hz),

3.67 (s, 3H), 2.60 (q, 2H), 2.06 (q, 4H), 1.14 (t, 3H), 1.01 (s, 9H), 0.70 (t, 6H);

HRMS: Calcd. for $\text{C}_{26}\text{H}_{40}\text{NO}_6\text{S}_2$ ($M+1$), 526.2297, found, 526.2285.

Example 155

Preparation of enantiomer 1 of (5-{1-Ethyl-1-[3-ethyl-4-(2-hydroxy-3,3-dimethyl-butoxy)-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid.



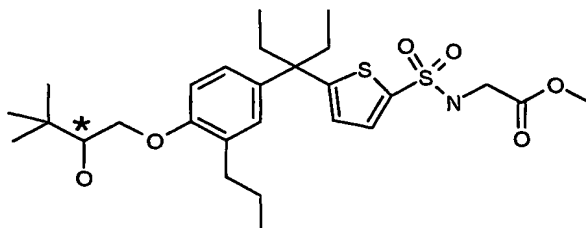
Using a procedure analogous to Example 137, enantiomer 1 of (5-{1-ethyl-1-[3-ethyl-4-(2-hydroxy-3,3-dimethyl-butoxy)-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid methyl ester gives the title compound (quant).

^1H NMR (CDCl_3) δ 7.44 (d, 1H, $J = 4.0$ Hz), 6.98, 7.01 (m, 2H), 6.74, 6.79 (m, 2H), 5.11 (t, 1H), 4.13 (dd, 1H, $J = 3.0, 9.4$ Hz), 3.90 (dd, 1H, $J = 8.9, 9.4$ Hz), 3.86 (d, 2H, $J = 5.3$ Hz), 3.73 (dd, 1H, $J = 3.0, 8.9$ Hz), 2.60 (q, 2H), 2.09 (m, 4H), 1.16 (t, 3H), 1.03 (s, 9H), 0.72 (t, 6H);

HRMS: Calcd. for $\text{C}_{25}\text{H}_{41}\text{N}_2\text{O}_6\text{S}_2$ ($M+18$), 529.2406, found, 529.2397.

Example 156

Preparation of enantiomer 1 of (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-propyl-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid methyl ester.



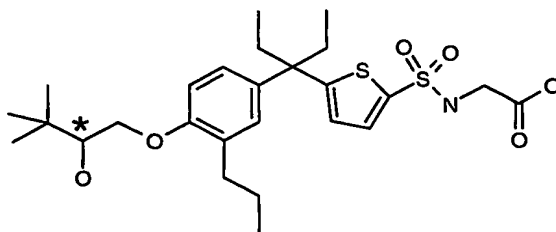
Using a procedure analogous to Example 150, 1-[4-(1-ethyl-1-thiophen-2-yl-propyl)-2-propyl-phenoxy]-3,3-dimethyl-butan-2-one gives the title compound (25%).

^1H NMR (CDCl_3) δ 7.43 (d, 1H, $J = 4.0$ Hz), 7.02 (dd, 1H, $J = 1.8, 8.8$ Hz), 7.00 (d, 1H, $J = 1.8$ Hz), 6.77 (d, 1H, $J = 4.0$ Hz), 6.75 (d, 1H, $J = 8.8$ Hz), 5.05 (t, 1H), 4.10 (dd, 1H, $J = 2.4, 8.8$ Hz), 3.88 (dd, 1H, $J = 8.8, 9.2$ Hz), 3.85 (d, 2H, $J = 5.2$ Hz), 3.71 (dd, 1H, $J = 2.4, 8.8$ Hz), 3.67 (s, 3H), 2.55 (t, 2H), 2.06 (q, 4H), 1.56 (m, 2H), 1.02 (s, 9H), 0.89 (t, 3H), 0.70 (t, 6H);

HRMS: Calcd. for $\text{C}_{27}\text{H}_{45}\text{N}_2\text{O}_6\text{S}_2$ ($\text{M}+18$), 557.2719, found, 557.2698.

Example 157

Preparation of (5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-propyl-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid.



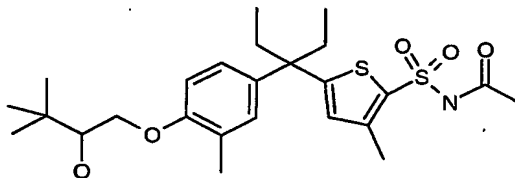
-295-

Using a procedure analogous to Example 137, (5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-propyl-phenyl]-propyl}-thiophene-2-sulfonylamine)-acetic acid methyl ester gives the title compound (quant).

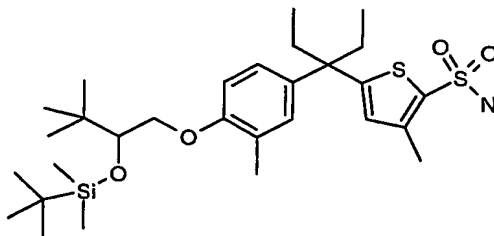
^1H NMR (CDCl_3) δ 7.43 (d, 1H, $J = 4.0$ Hz), 6.99 (d, 1H, $J = 8.4$ Hz), 6.98 (s, 1H), 6.78 (d, 1H, $J = 4.0$ Hz), 6.75 (d, 1H, $J = 8.4$ Hz), 5.09 (t, 1H), 4.10 (dd, 1H, $J = 2.4, 9.4$ Hz), 3.88 (dd, 1H, $J = 8.8, 9.4$ Hz), 3.86 (d, 2H, $J = 5.3$ Hz), 3.72 (dd, 1H, $J = 2.4, 8.8$ Hz), 2.55 (t, 2H), 2.07 (m, 4H), 1.56 (m, 2H), 1.01 (s, 9H), 0.89 (t, 3H), 0.71 (t, 6H); HRMS: Calcd. for $\text{C}_{26}\text{H}_{43}\text{N}_2\text{O}_6\text{S}_2$ ($M+18$), 543.2563, found, 543.2541.

10 Example 158

Preparation of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonic acid acetyl-amide



A. 5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonic acid amide

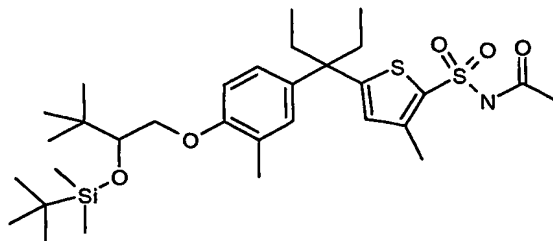


Using a procedure analogous to Example 134E, 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonyl chloride and NH_4OH give the title compound (39%).

^1H NMR (CDCl_3) δ 7.02 (dd, 1H, $J = 2.9, 8.6$ Hz), 6.96 (d, 1H, $J = 2.2$ Hz), 6.68 (d, 1H, $J = 8.6$ Hz), 6.60 (s, 1H), 4.83 (s, 2H), 3.98 (dd, 1H, $J = 3.3, 9.9$ Hz), 3.85 (dd, 1H, $J = 5.5, 9.9$ Hz), 3.67 (dd, 1H, $J = 3.3, 5.5$ Hz), 2.43 (s, 3H), 2.20 (s, 3H), 2.06 (q, 4H), 0.96 (s, 9H), 0.89 (s, 9H), 0.70 (t, 6H), 0.11 (s, 3H), 0.05 (s, 3H).

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- B. 5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonic acid acetyl-amide.

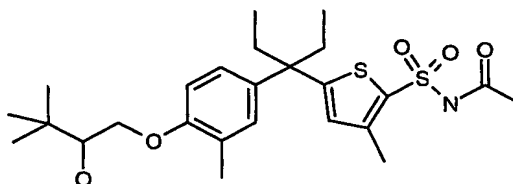


A mixture of 5-(1-{4-[2-(tert-Butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonic acid amide (227 mg, 0.4 mmol), EDCI (92 mg, 0.48 mmol), acetic acid (27 μ L, 0.48 mmol) and DMAP (50 mg) in dichloromethane (10 ml) is stirred at RT overnight. The reaction is diluted with dichloromethane and washed with 1N HCl. The organic phase is concentrated and chromatographed (Hex to 20% EtOAc/Hex) to give the title compound (240 mg, 98%).

^1H NMR (CDCl_3) δ 7.99 (s, 1H), 7.02 (d 1H, J = 8.8 Hz), 6.96 (s, 1H), 6.69 (d, 1H, J = 8.8 Hz), 6.59 (s, 1H), 3.98 (dd, 1H, J = 3.4, 9.8 Hz), 3.85 (dd, 1H, J = 5.8, 9.8 Hz), 3.67 (dd, 1H, J = 3.4, 5.8 Hz), 2.43 (s, 3H), 2.20 (s, 3H), 2.13 (s, 3H), 2.06 (q, 4H), 0.96 (s, 9H), 0.89 (s, 9H), 0.70 (t, 6H), 0.11 (s, 3H), 0.05 (s, 3H);

ES-MS: 610 ($M+1$).

- C. 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonic acid acetyl-amide.



Using a procedure analogous to example-TWM-1F, 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonic acid acetyl-amide gives the title compound (240 mg, 62%).

^1H NMR (CDCl_3) δ 7.97 (s, 1H), 7.02 (dd, 1H, J = 2.4, 8.3 Hz), 6.99 (s, 1H), 6.74 (d, 1H, J = 8.3 Hz), 6.58 (s, 1H), 4.10 (dd, 1H, J = 2.4, 9.3 Hz), 3.88 (dd, 1H, J = 8.8, 9.3 Hz),

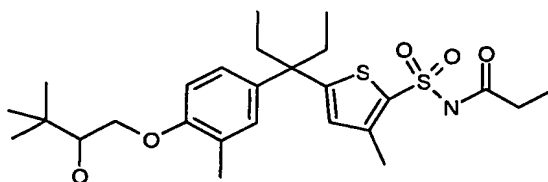
-297-

3.72 (dd, 1H, J = 2.4, 8.8 Hz), 2.46 (s, 3H), 2.21 (s, 3H), 2.13 (s, 3H), 2.07 (m, 4H), 1.02 (s, 9H), 0.70 (t, 6H).

HRMS: calcd. for C₂₅H₃₈NO₅S₂ (M+1), 496.2191, found, 496.2188.

5 Example 159

Preparation of 5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonic acid propionyl-amide.



10

Using procedures analogous to Example 158B and Example 158C, 5-(1-{4-[2-(tert-butyl-dimethyl-silanyloxy)-3,3-dimethyl-butoxy]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-sulfonic acid amide and propionic acid give the title compound (66%).

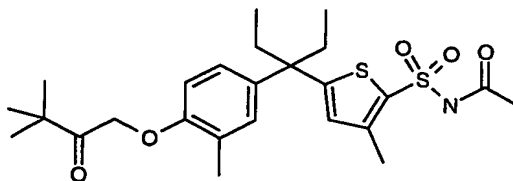
15 ¹H NMR (CDCl₃) δ 8.56 (s, 1H), 7.02 (dd, 1H, J = 2.4, 8.3 Hz), 6.98 (d, 1H, J = 2.4 Hz), 6.73 (d, 1H, J = 8.3 Hz), 6.56 (s, 1H), 4.10 (dd, 1H, J = 3.0, 9.3 Hz), 3.88 (dd, 1H, J = 8.8, 9.3 Hz), 3.71 (dd, 1H, J = 3.0, 8.8 Hz), 2.47 (s, 3H), 2.33 (q, 2H), 2.19 (s, 3H), 2.07 (m, 4H), 1.08 (t, 3H), 1.02 (s, 9H), 0.68 (t, 6H);

HRMS: calcd. for C₂₆H₄₀NO₅S₂ (M+1), 510.2348, found, 510.2359.

20

Example 160

Preparation of 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid acetyl-amide.



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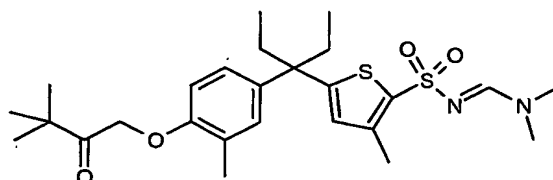
Using a procedure analogous to Example 138C, 5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonic acid acetyl-amide gives the title compound (84%).

¹H NMR (CDCl₃) δ 8.05 (s, 1H), 6.91, 6.99 (m, 2H), 6.57 (s, 1H), 6.51 (d, 1H, J = 8.5 Hz), 4.86 (s, 2H), 2.46 (s, 3H), 2.26 (s, 3H), 2.13 (s, 3H), 2.07 (m, 4H), 1.26 (s, 9H), 0.69 (t, 6H).

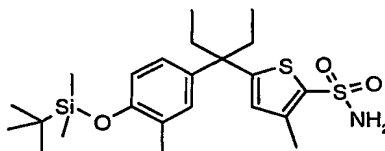
HRMS: calcd. for C₂₅H₃₆NO₅S₂ (M+1), 494.2035, found, 494.2040.

Example 161

10 Preparation of 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid dimethylaminemethyleneamide.



A. 5-{1-[4-(tert-Butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid amide.



15

To a 0 °C solution of tert-butyl-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-dimethyl-silane (28.37 g, 72.99 mmol) in THF (360 ml) is added dropwise n-butyllithium (47.90 ml, 76.64 mmol, 1.6M in Hex) and stirred at 0 °C for 30 m. The reaction mixture is cannulated into a -78 °C solution of sulfonyl chloride (11.73 ml, 145.98 mmol) in pentane (360 ml) and the reaction warms to RT for 2 h. The reaction mixture is concentrated and the residue is dissolved in acetone (100 ml) and added to a 0 °C mixture of acetone (1 L) and concentrated NH₄OH (150 ml) and stirs at 0 °C for 2 h. The reaction mixture is concentrated and the residue is partitioned between EtOAc (700 ml) and satd aqueous NH₄Cl (200 ml). The organic layer is MgSO₄ dried, concentrated

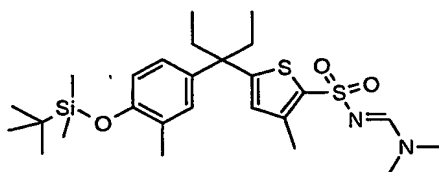
25

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and chromatographed (330 g SiO₂, 50% EtOAc/Hex) to yield the title compound (5.34 g, 16%).

¹NMR (400MHz, CDCl₃) δ 6.97 (d, 1H, J=2.2 Hz), 6.91 (dd, 1H, J=8.6, 2.4 Hz), 6.66 (d, 1H, J=8.4 Hz), 6.58 (s, 1H), 4.90 (s, 2H), 2.42 (s, 3H), 2.17 (s, 3H), 2.09-2.04 (m, 4H), 1.00 (s, 9H), 0.69 (t, 6H, J=7.3 Hz), 0.21 (s, 6H).

B. 5-{1-[4-(tert-Butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid dimethylaminemethyleneamide.



10

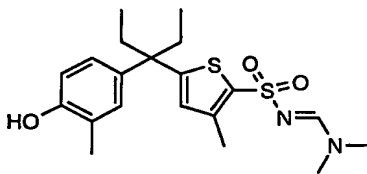
To a solution of 5-{1-[4-(tert-butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid amide (5.34 g, 11.42 mmol) in THF (200 ml) is added dimethyl formamide dimethyl acetamide (1.52 ml, 11.42 mmol) and stirred overnight. The reaction mixture is diluted with EtOAc (500 ml) and washed with 0.2N HCl (100 ml). The organic layer is MgSO₄ dried, concentrated and chromatographed (120 g SiO₂, 50% EtOAc/Hex) to yield the title compound (6.0 g, quant.).

15

¹NMR (400MHz, CDCl₃) δ 8.10 (s, 1H), 6.98 (d, 1H, J=2.2 Hz), 6.92 (dd, 1H, J=8.4, 2.6 Hz), 6.65 (d, 1H, J=8.4 Hz), 6.52 (s, 1H), 3.12 (s, 3H), 3.05 (s, 3H), 2.41 (s, 3H), 2.16 (s, 3H), 2.09-1.99 (m, 4H), 1.00 (s, 9H), 0.68 (t, 6H, J=7.3 Hz), 0.20 (s, 6H).

20

C. 5-[1-Ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophene-2-sulfonic acid dimethylaminemethyleneamide



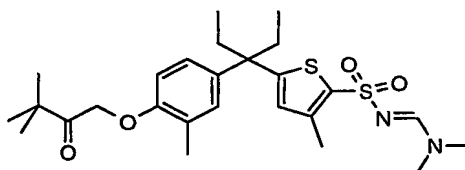
25

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To a 0 °C solution of 5-{1-[4-(tert-butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid dimethylaminemethyleneamide (6.1 g, 11.68 mmol) in THF (150 ml) is added dropwise tetrabutylammonium fluoride (15.62 ml, 15.62 mmol, 1.0M in THF) and is warmed to RT for 1 h. The reaction is quenched with satd aqueous NH₄Cl (100 ml) and extracted with Et₂O (2 x 200 ml). The combined organic layers are dried MgSO₄ dried, concentrated and chromatographed (120 g SiO₂, 50% EtOAc/Hex) to yield the title compound (4.63 g, 97%).

¹NMR (400MHz, CDCl₃) δ 8.09 (s, 1H), 6.97 (s, 1H), 6.95 (d, 1H, J=8.4 Hz), 6.68 (d, 1H, J=8.4 Hz), 6.52 (s, 1H), 4.84 (s, 1H), 3.12 (s, 3H), 3.04 (s, 3H), 2.40 (s, 3H), 2.21 (s, 3H), 2.08-2.01 (m, 4H), 0.68 (t, 6H, J=7.3 Hz).

D. 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid dimethylaminemethyleneamide.



To a solution of 5-[1-ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophene-2-sulfonic acid dimethylaminemethyleneamide (5.1 g, 12.48 mmol) in 2-butanone (50 ml) is added potassium carbonate (2.59 g, 18.72 mmol), and chloropinacolone (3.28 ml, 24.91 mmol). The reaction is refluxed overnight, filtered, and concentrated. The residue is partitioned between EtOAc (400 ml) and 0.2N HCl (100 ml). The organic layer is washed with brine (100 ml), MgSO₄ dried, concentrated, and chromatographed (120 g SiO₂, 50% EtOAc/Hex) to yield the title compound (6.11 g, 97%).

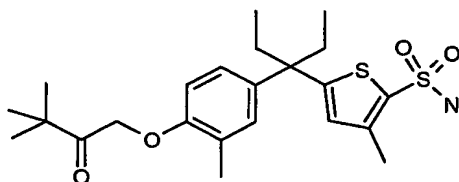
¹NMR (400MHz, CDCl₃) δ 8.10 (s, 1H), 7.01 (s, 1H), 6.98 (d, 1H, J=9.2 Hz), 6.52 (s, 1H), 6.50 (d, 1H, J=8.4 Hz), 4.85 (s, 2H), 3.13 (s, 3H), 3.05 (s, 3H), 2.41 (s, 3H), 2.26 (s, 3H), 2.09-2.01 (m, 4H), 1.26 (s, 9H), 0.68 (t, 6H, J=7.3 Hz).

HRMS: calcd. for C₂₆H₃₉N₂O₄S₂ (M+1), 507.2351, found, 507.2349.

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Example 162

Preparation of 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid amide.



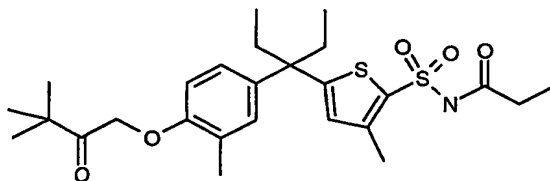
5 A solution of 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid dimethylaminemethyleneamide (6.11 g, 12.06 mmol) in 5N HCl/MeOH (180/200 ml) is refluxed overnight. The reaction mixture is concentrated and the residue redissolved in EtOAc (500 ml) and is washed with water (100 ml), brine (100 ml), dried (MgSO₄), concentrated and chromatographed (120 g SiO₂, 60% EtOAc/Hex) to yield the title compound (5.50 g, quant.).

¹NMR (400MHz, CDCl₃) δ 7.01-6.95 (m, 2H), 6.57 (s, 1H), 6.51 (d, 1H, J=7.9 Hz), 4.92 (s, 2H), 4.85 (s, 2H), 2.41 (s, 3H), 2.26 (s, 3H), 2.09-2.03 (m, 4H), 1.25 (s, 9H), 0.69 (t, 6H, =7.3 Hz).

EI-MS: 507.3 (M+1)

Example 163

Preparation of 5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid propionyl-amide.



20 A mixture of 5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid amide (330 mg, 0.73 mmol), EDCI (210 mg, 1.1 mmol), propionic acid (82 μL, 1.1 mmol) and DMAP (50 mg) in dichloromethane (10 ml) is stirred overnight. The reaction is diluted with dichloromethane and washed with 1N HCl. The organic phase is concentrated and chromatographed (Hex to 30% EtOAc/Hex) to give the title compound (92%).

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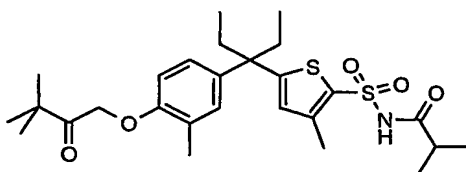
^1H NMR (CDCl_3) δ 8.10 (s, 1H), 6.98 (s, 1H), 6.97 (d, 1H, $J = 8.3$ Hz), 6.56 (s, 1H), 6.51 (d, 1H, $J = 8.3$ Hz), 4.86 (s, 2H), 2.48 (s, 3H), 2.34 (q, 2H), 2.26 (s, 3H), 2.06 (m, 4H), 1.26 (s, 9H), 1.10 (t, 3H), 0.69 (t, 6H);

HRMS: calcd. for $\text{C}_{26}\text{H}_{41}\text{N}_2\text{O}_5\text{S}_2$ ($M+18$), 525.2457, found, 525.2433.

5

Example 164

Preparation of 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid isobutyryl-amide.



10

Using a procedure analogous to Example 163, 5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid amide and 2-methylpropionic acid give the title compound (56%).

^1NMR (400MHz, CDCl_3) δ 8.00 (s, 1H), 6.99-6.94 (m, 2H), 6.55 (s, 1H), 6.50 (d, 1H, $J=8.4$ Hz), 4.85 (s, 2H), 2.49 (s, 3H), 2.44 (sept, 1H, $J=7.0$ Hz), 2.25 (s, 3H), 2.11-2.02 (m, 4H), 1.25 (s, 9H), 1.11 (d, 6H, $J=7.0$ Hz), 0.68 (t, 6H, $J=7.3$ Hz).

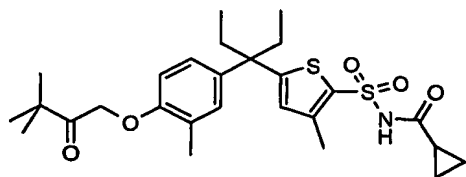
15

ES-MS: 522 ($M+1$)

20

Example 165

Preparation of 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid cyclopropanecarbonyl-amide.



25

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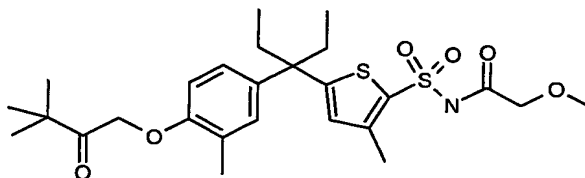
Using a procedure analogous to Example 163, 5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid amide and cyclopropanecarboxylic acid give the title compound (60%).

¹NMR (400MHz, CDCl₃) δ 8.43 (s, 1H), 6.99-6.94 (m, 2H), 6.56 (s, 1H), 6.51 (d, 1H, J=8.4 Hz), 4.86 (s, 2H), 2.46 (s, 3H), 2.25 (s, 3H), 2.12-2.01 (m, 4H), 1.68-1.58 (m, 1H), 1.26 (s, 9H), 1.05-0.99 (m, 2H), 0.89-0.82 (m, 2H), 0.68 (t, 6H, J=7.3 Hz).

EI-MS: 520.2 (M+H), 518.4 (M-H)

Example 166

Preparation of 5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid (2-methoxy-acetyl)-amide.



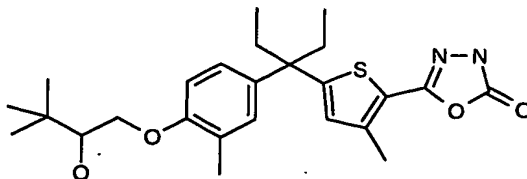
Using a procedure analogous to Example 163, 5-{1-[4-(3,3-dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonic acid amide and methoxy-acetic acid give the title compound (84%).

¹H NMR (CDCl₃) δ 8.91 (s, 1H), 7.00 (s, 1H), 6.97 (dd, 1H, J = 2.6, 8.3 Hz), 6.54 (s, 1H), 6.51 (d, 1H, J = 8.3 Hz), 4.86 (s, 2H), 3.90 (s, 2H), 3.43 (s, 3H), 2.48 (s, 3H), 2.26 (s, 3H), 2.06 (m, 4H), 1.26 (s, 9H), 0.69 (t, 6H);

HRMS: calcd. for C₂₆H₄₁N₂O₆S₂ (M+18), 541.2406, found, 541.2400.

Example 169

Preparation of 5-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-yl)-3H-[1,3,4]oxadiazol-2-one.



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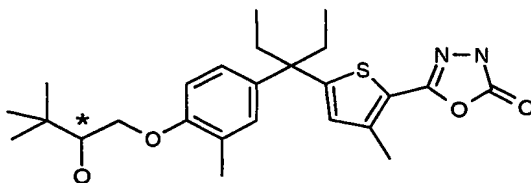
A mixture of 5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid hydrazide (432 mg, 1mmol), 1,1'-carbonyldiimidazole (405 mg, 2.5 mmol) and triethylamine (0.28 ml, 2 mmol) in THF (10 ml) is stirred at reflux overnight. It is diluted with EtOAc, washed with 1N HCl solution.
 5 The organic phase is concentrated and chromatographed (Hex to 20% EtOAc/Hex to give the title compound (290 mg, 63%).

¹H NMR (CDCl₃) δ 8.51 (s, 1H), 7.05 (dd, 1H, J = 2.4, 8.8 Hz), 7.01 (s, 1H), 6.73 (d, 1H, J = 8.8 Hz), 6.62 (s, 1H), 4.09 (dd, 1H, J = 2.6, 9.2 Hz), 3.87 (dd, 1H, J = 8.8, 9.2 Hz), 3.70 (dd, J = 2.6, 8.8 Hz), 2.42 (s, 3H), 2.20 (s, 3H), 2.08 (m, 4H), 1.01 (s, 9H), 0.69 (t, 6H);

HRMS: calcd. for C₂₅H₃₅N₂O₄S (M+1), 459.2318, found, 459.2325.

Example 170

Preparation of enantiomer 1 of 5-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-yl)-3H-[1,3,4]oxadiazol-2-one.



Using an analogous procedure as Example 169, enantiomer 1 of 5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid hydrazide (Example 168) gives the title compound (65%).

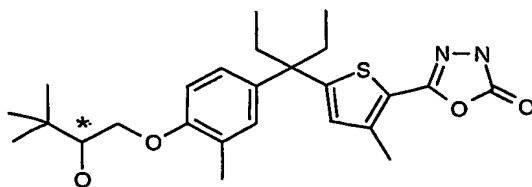
Enantiomer 1: ¹H NMR (CDCl₃) equivalent to Example 169;

HRMS: calcd. for C₂₅H₃₅N₂O₄S (M+1), 459.2318, found, 459.2321.

Example 171

Preparation of enantiomer 2 of 5-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-yl)-3H-[1,3,4]oxadiazol-2-one

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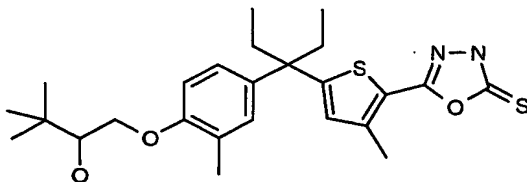


Using analogous procedures as in Example 168 and Example 169, enantiomer 2 of 1-{4-[1-ethyl-1-(5-methoxycarbonyl-4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenoxy}-3,3-dimethyl-butan-2-ol (Example 6B) gives the title compound (83%).

- 5 Enantiomer 2: ^1H NMR (CDCl_3) equivalent to Example 169;
HRMS: calcd. for $\text{C}_{25}\text{H}_{35}\text{N}_2\text{O}_4\text{S}$ ($\text{M}+1$), 459.2318, found, 459.2320.

Example 172

- Preparation of 5-(5-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-yl)-3H-[1,3,4]oxadiazole-2-thione.
- 10



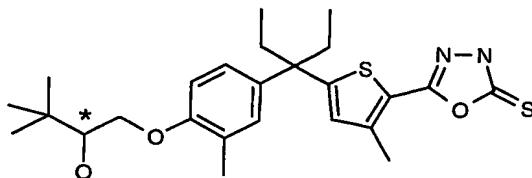
- A mixture of 5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid hydrazide (432 mg, 1 mmol), carbon disulfide (0.15 ml, 2.5 mmol) and KOH (62 mg, 1.1 mmol) in methanol (15 ml) is
- 15 refluxed overnight. The reaction is concentrated and partitioned between EtOAc and 1N HCl. The organic phase is concentrated and chromatographed to give the title compound (320 mg, 68%).

- ^1H NMR (CDCl_3) δ 7.05 (d, 1H, $J = 8.3$ Hz), 7.00 (s, 1H), 6.74 (d, 1H, $J = 8.3$ Hz), 6.66 (s, 1H), 4.10 (dd, 1H, $J = 2.6, 9.2$ Hz), 3.87 (dd, 1H, $J = 8.8, 9.2$ Hz), 3.71 (dd, $J = 2.6, 8.8$ Hz), 2.46 (s, 3H), 2.20 (s, 3H), 2.08 (m, 4H), 1.01 (s, 9H), 0.71 (t, 6H);
- 20 HRMS: calcd. for $\text{C}_{25}\text{H}_{35}\text{N}_2\text{O}_3\text{S}_2$ ($\text{M}+1$), 475.2089, found, 475.2094.

Example 173

- Preparation of enantiomer 1 of 5-(5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophen-2-yl)-3H-[1,3,4]oxadiazole-2-thione.
- 25

-306-



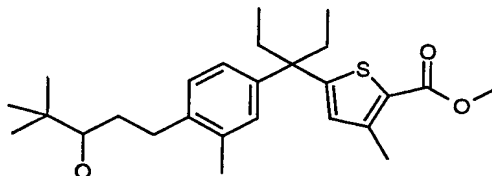
Using an analogous procedure as in Example 172, enantiomer 1 of 5-{1-ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid hydrazide (Example 168) gives the title compound (72%).

5 ¹H NMR (CDCl₃): equivalent to Example 172;

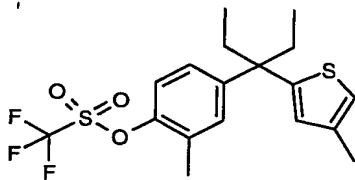
HRMS: calcd. for C₂₅H₃₅N₂O₃S₂ (M+1), 475.2089, found, 475.2084.

Example 174

Preparation of 5-{1-Ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methyl ester.



A. Trifluoromethanesulfonic acid 4-[1-ethyl-1-(4-methyl-thiophen-2-yl) propyl]-2-methyl-phenyl ester.

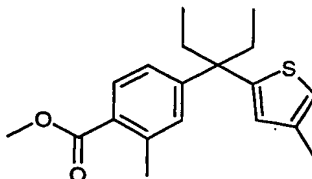


15 To a mixture of 3'-[4-(hydroxy)-3-methylphenyl]-3'-[4-methylthiophen-2-yl]pentane (8.8 g, 32.2 mmol) and triethylamine (6.8 ml, 48.3 mmol) in dichloromethane (200 ml) at -78 °C is added trifluoromethanesulfonic anhydride (6.5 ml, 38.6 mmol) dropwise and warmed to RT. The reaction is stirred for 1 h, diluted with dichloromethane and washed with 0.2 N HCl followed by brine. The organic layer is concentrated to give

20 the title compound (12 g, 92%).

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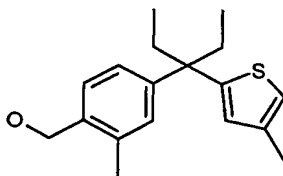
B. 4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-benzoic acid methyl ester.



A mixture of trifluoromethanesulfonic acid 4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl ester (12 g, 29.62 mmol), Pd(OAc)₂ (699 mg, 3 mmol), dppf (3.3 g, 6 mmol), triethylamine (12.5 ml, 90 mmol), methanol (12 ml, 300 mmol), and N,N-dimethylformamide (40 ml) is treated with carbon monoxide (1000 psi) at 110 °C in a Parr-reactor for 48 h. The reaction is concentrated, dissolved in is evaporated in EtOAc and filtered through a silica gel pad. The filtrate is concentrated and chromatographed (Hex to 10% EtOAc/Hex) to give the title compound (6.9 g, 73%).

¹H NMR (CDCl₃) δ 7.83 (d, 1H, J = 8.8 Hz), 7.16 (m, 2H), 6.73 (s, 1H), 6.60 (s, 1H), 3.87 (s, 3H), 2.58 (s, 3H), 2.21 (s, 3H), 2.13 (m, 4H), 0.71 (t, 6H).

C. {4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-methanol.



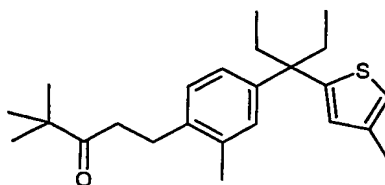
15

To a 0 °C solution of 4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-benzoic acid methyl ester (6.7 g, 21.2 mmol) in THF (100 ml) is added 1M LiAlH₄/THF (32 ml, 32 mmol). After stirring at RT for 2 h, the reaction is quenched with water (1 ml) followed by 5N NaOH solution (1 ml) and water (3 ml). The mixture is filtered and the filtrate is concentrated to give the title compound as a clear oil (6 g, 98%).

20

D. 1-{4-[1-Ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-4,4-dimethyl-pentan-3-one.

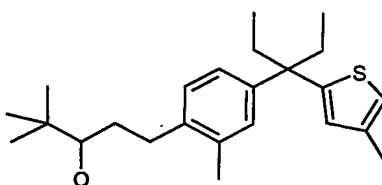
-308-



To a 0 °C solution of {4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-methanol (6 g,) in THF (50 ml) is treated with PBr₃ (2.2 ml, 23.3 mmol) and warmed to RT. After stirring for 2 h, the mixture is partitioned between EtOAc and brine.

- 5 The organic layer is MgSO₄ dried, concentrated, and dissolved in anhydrous THF (30 ml) to give a solution of {4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-methane bromide. Separately, a solution of 3,3-dimethyl-butan-2-one (5.3 ml, 42.4 mmol) in THF (15 ml) is treated with LiHMDS (42.4 ml, 42.4 mmol, 1M in THF) at – 70 °C for 1 h. This solution is transferred (via cannula) into a – 70 °C solution of {4-[1-
- 10 ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-methane bromide/THF. The mixture is warmed to RT and stirred for 1 h. The reaction is diluted with EtOAc and washed with 0.2 N HCl until the aq layer is pH 2. The organic layer is concentrated to give the title compound (6.2 g, 79%).

- 15 E. 1-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-4,4-dimethyl-pentan-3-ol.

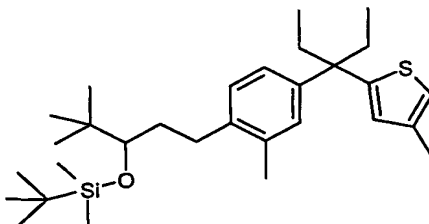


- Using a procedure analogous to Example 134B, 1-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-4,4-dimethyl-pentan-3-one and NaBH₄ give the
- 20 title compound (quant).

¹H NMR (CDCl₃) δ 7.02, 7.07 (m, 3H), 6.71 (s, 1H), 6.61 (s, 1H), 3.26 (dd, 1H, J = 2.0, 10.3 Hz), 2.88 (m, 1H), 2.56 (m, 1H), 2.28 (s, 3H), 2.20 (s, 3H), 2.08 (m, 4H), 1.78 (m, 1H), 1.58 (m, 1H), 0.90 (s, 9H), 0.70 (t, 6H).

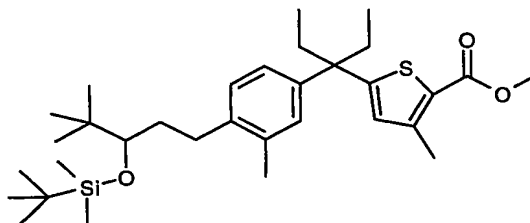
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F. tert-Butyl-[1-(2-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2 methyl-phenyl}-ethyl)-2,2-dimethyl-propoxy]-dimethyl-silane.



Using a procedure analogous to Example 134C, 1-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2-methyl-phenyl}-4,4-dimethyl-pentan-3-ol gives the title compound (quant).

G. 5-(1-{4-[3-(tert-butyl-dimethyl-silanyloxy)-4,4-dimethyl-pentyl]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-carboxylic acid methyl ester.

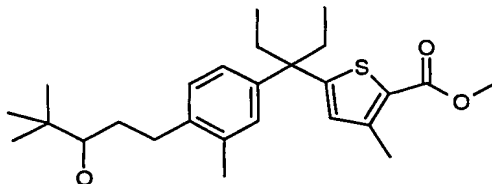


To a 0 °C solution of tert-butyl-[1-(2-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2 methyl-phenyl}-ethyl)-2,2-dimethyl-propoxy]-dimethyl-silane (1.46 g, 3 mmol) in THF (15 ml) is added 1.6 M n-BuLi/Hex (2 ml, 3.3 mmol). After 45 m, the mixture is transferred (via cannula) into a -70 °C solution of methyl chloroformate (0.26 ml, 3.3 mmol) in pentane (10 ml). The mixture is warmed to RT and stirred for 3 h. The reaction is diluted with EtOAc, washed with 0.2 N HCl until the aq layer is pH 2, and followed by washing with satd sodium bicarbonate. The organic layer is concentrated and chromatographed (Hex to 5% EtOAc/Hex) to give the title compound (1.05 g, 64%).

¹H NMR (CDCl₃) δ 6.99, 7.04 (m, 3H), 6.62 (s, 1H), 3.80 (s, 3H), 3.35 (dd, 1H, J = 2.9, 7.3 Hz), 2.76 (m, 1H), 2.48 (s, 3H), 2.41 (m, 1H), 2.26 (s, 3H), 2.08 (m, 4H), 1.78 (m, 1H), 1.59 (m, 1H), 0.93 (s, 9H), 0.88 (s, 9H), 0.70 (t, 6H), 0.10 (s, 3H), 0.07 (s, 3H).

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H. 5-{1-Ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methyl ester.



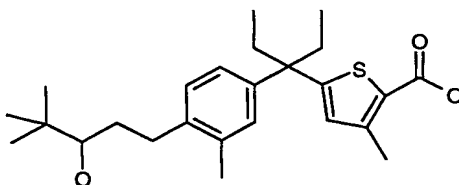
Using a procedure analogous to Example 134F, 5-(1-{4-[3-(tert-butyl-dimethyl-silanyloxy)-4,4-dimethyl-pentyl]-3-methyl-phenyl}-1-ethyl-propyl)-3-methyl-thiophene-2-carboxylic acid methyl ester gives the title compound (94%).

^1H NMR (CDCl_3) δ 7.00, 7.07 (m, 3H), 6.62 (s, 1H), 3.80 (s, 3H), 3.25 (dd, 1H, $J = 1.8$, 10.5 Hz), 2.88 (m, 1H), 2.55 (m, 1H), 2.48 (s, 3H), 2.28 (s, 3H), 2.08 (m, 4H), 1.79 (m, 1H), 1.58 (m, 1H), 0.90 (s, 9H), 0.70 (t, 6H);

HRMS: calcd. for $\text{C}_{26}\text{H}_{38}\text{O}_3\text{NaS}$ ($M+23$), 453.2439, found 453.2465.

Example 175

Preparation of 5-{1-Ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid.



Using LiOH hydrolysis as described in Example 137, 5-{1-ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid methyl ester gives the title compound (94%).

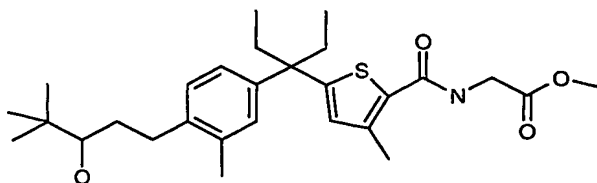
^1H NMR (CDCl_3) δ 7.00, 7.07 (m, 3H), 6.62 (s, 1H), 3.25 (dd, 1H, $J = 1.8$, 10.5 Hz), 2.88 (m, 1H), 2.55 (m, 1H), 2.48 (s, 3H), 2.28 (s, 3H), 2.08 (m, 4H), 1.79 (m, 1H), 1.58 (m, 1H), 0.90 (s, 9H), 0.70 (t, 6H);

HRMS: calcd. for $\text{C}_{25}\text{H}_{36}\text{O}_3\text{NaS}$ ($M+23$), 439.2283, found 439.2283.

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Example 176

Preparation of [(5-{1-Ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amine]-acetic acid methyl ester.



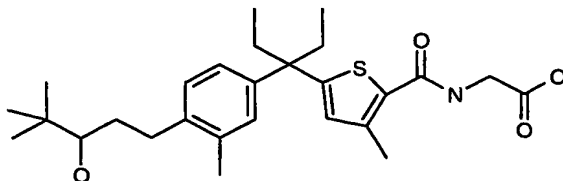
A mixture of 5-{1-ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carboxylic acid (160 mg, 0.38 mmol), 2-amino-acetic acid methyl ester hydrochloride (53 mg, 0.42 mmol), EDCI (89 mg, 0.46 mmol) and triethylamine (0.134 ml, 0.96 mmol) in dichloromethane (5 ml) is stirred at RT overnight. The reaction is concentrated, partitioned between 1N HCl and EtOAc. The organic layer is concentrated and chromatographed (Hex to 30% EtOAc/Hex) to give the title compound (75 mg, 40%).

¹H NMR (CDCl₃) δ 7.07 (d, 1H, J = 8.7 Hz), 7.00 (d, 1H, J = 8.7 Hz), 6.99 (s, 1H), 6.63 (s, 1H), 6.20 (t, 1H), 4.16 (d, 2H, J = 5.3 Hz), 3.78 (s, 3H), 3.26 (bd, 1H, J = 9.3 Hz), 2.88 (m, 1H), 2.56 (m, 1H), 2.47 (s, 3H), 2.28 (s, 3H), 2.08 (m, 4H), 1.78 (m, 1H), 1.58 (m, 1H), 0.90 (s, 9H), 0.70 (t, 6H).

ES-MS: 488 (M+1).

Example 177

Preparation of [(5-{1-Ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid.



Using LiOH hydrolysis as described in Example 136, [(5-{1-ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-carbonyl)-amino]-acetic acid methyl ester gives the title compound (quant).

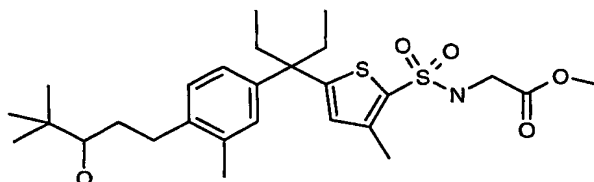
-312-

^1H NMR (CDCl_3) δ 7.07 (d, 1H, $J = 8.7$ Hz), 7.00 (d, 1H, $J = 8.7$ Hz), 6.99 (s, 1H), 6.63 (s, 1H), 6.21 (t, 1H), 4.20 (d, 2H, $J = 5.3$ Hz), 3.26 (bd, 1H, $J = 9.3$ Hz), 2.88 (m, 1H), 2.56 (m, 1H), 2.47 (s, 3H), 2.28 (s, 3H), 2.08 (m, 4H), 1.78 (m, 1H), 1.58 (m, 1H), 0.90 (s, 9H), 0.70 (t, 6H);

HRMS: calcd. for $\text{C}_{27}\text{H}_{40}\text{NO}_4\text{S}$ ($M+1$), 474.2678, found 474.2687.

Example 178

Preparation of (5-{1-Ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamino)-acetic acid methyl ester.



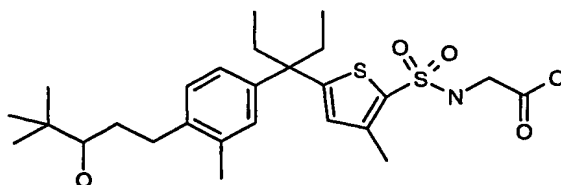
Using procedures analogous to Example 134D to Example 134F, from tert-butyl-[1-(2-{4-[1-ethyl-1-(4-methyl-thiophen-2-yl)-propyl]-2 methyl-phenyl}-ethyl)-2,2-dimethyl-propoxy]-dimethyl-silane and 2-amino-acetic acid methyl ester hydrochloride gives the title compound (24%).

^1H NMR (CDCl_3) δ 7.07 (d, 1H, $J = 7.9$ Hz), 7.02 (s, 1H), 6.97 (d, 1H, $J = 7.9$ Hz), 6.64 (s, 1H), 5.12 (t, 1H), 3.82 (d, 2H, $J = 5.3$ Hz), 3.65 (s, 3H), 3.32 (d, 1H, $J = 9.3$ Hz), 2.88 (m, 1H), 2.56 (m, 1H), 2.42 (s, 3H), 2.30 (s, 3H), 2.08 (m, 4H), 1.88 (m, 1H), 1.54 (m, 1H), 0.87 (s, 9H), 0.72 (t, 6H).

ES-MS: 524 ($M+1$).

Example 179

(5-{1-Ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamino)-acetic acid.



-313-

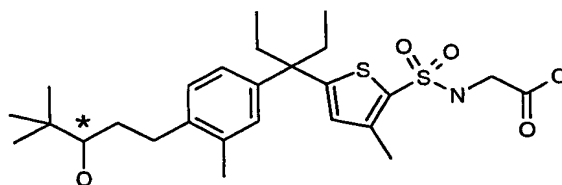
Using LiOH hydrolysis as described in Example 136, (5-{1-ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester gives the title compound (quant).

^1H NMR (CDCl_3) δ 7.08 (d, 1H, $J = 7.9$ Hz), 7.03 (s, 1H), 6.98 (d, 1H, $J = 7.9$ Hz), 6.65 (s, 1H), 5.12 (t, 1H), 3.82 (d, 2H, $J = 5.3$ Hz), 3.32 (d, 1H, $J = 9.3$ Hz), 2.88 (m, 1H), 2.56 (m, 1H), 2.42 (s, 3H), 2.30 (s, 3H), 2.08 (m, 4H), 1.88 (m, 1H), 1.54 (m, 1H), 0.87 (s, 9H), 0.72 (t, 6H).

HRMS: calcd. for $\text{C}_{26}\text{H}_{43}\text{N}_2\text{O}_5\text{S}_2$ ($M+18$), 527.2613, found 527.2639.

10 Example 180 and Example 181

Preparation of enantiomers of (5-{1-ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylaminoo)-acetic acid.



A racemic mixture of (5-{1-ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid (180 mg) is chromatographed on a Chiralpak AD column (0.46 x 25 cm) to give the title compounds. HPLC condition: 0.1% trifluoroacetic acid in 30% isopropanol/hept; flow rate: 1.0 ml/m; UV: 225 nm.

Enantiomer 1, Example 179: 70 mg (39%); rt: 6.63 m;

^1H NMR (CDCl_3) equivalent to Example 179

HRMS: calcd. for $\text{C}_{26}\text{H}_{40}\text{NO}_5\text{S}_2$ ($M+1$), 510.2348, found 510.2333.

Enantiomer 2, Example 180: 60 mg (33%); rt: 8.60 m.

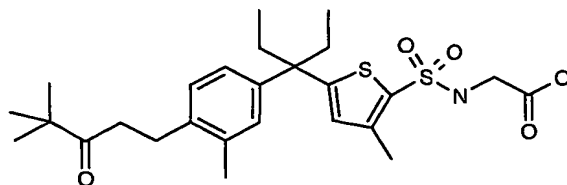
^1H NMR (CDCl_3) equivalent to Example 179;

HRMS: calcd. for $\text{C}_{26}\text{H}_{40}\text{NO}_5\text{S}_2$ ($M+1$), 510.2348, found 510.2359.

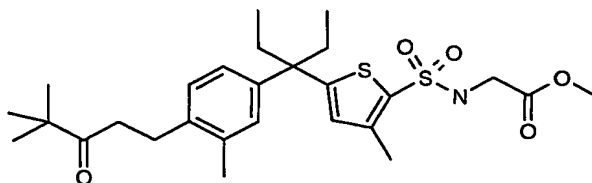
Example 182

Preparation of (5-{1-[4-(4,4-Dimethyl-3-oxo-pentyl)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid.

-314-



A. (5-{1-[4-(4,4-Dimethyl-3-oxo-pentyl)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester

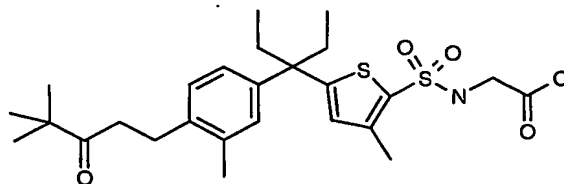


Using the pyridinium dichromate oxidation analogous to Example 139C, (5-{1-ethyl-1-[4-(3-hydroxy-4,4-dimethyl-pentyl)-3-methyl-phenyl]-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester gives the title compound (96%).

¹H NMR (CDCl₃) δ 6.96, 7.02 (m, 3H), 6.59 (s, 1H), 5.22 (t, 1H), 3.83 (d, 1H, J = 5.7 Hz), 3.65 (s, 3H), 2.82 (t, 2H), 2.72 (t, 2H), 2.40 (s, 3H), 2.27 (s, 3H), 2.07 (m, 4H), 1.10 (s, 9H), 0.68 (t, 6H);

ES-MS: 522 (M+1).

B. (5-{1-[4-(4,4-Dimethyl-3-oxo-pentyl)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid



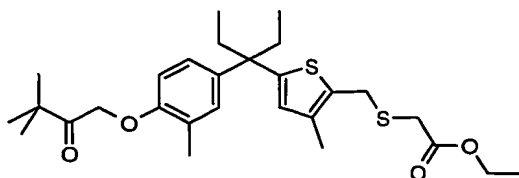
Using LiOH hydrolysis as described in Example 137, (5-{1-[4-(4,4-dimethyl-3-oxo-pentyl)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-sulfonylamine)-acetic acid methyl ester gives the title compound (quant).

¹H NMR (CDCl₃) δ 6.94, 7.01 (m, 3H), 6.60 (s, 1H), 5.30 (t, 1H), 3.86 (d, 1H, J = 4.8 Hz), 2.82 (t, 2H), 2.74 (t, 2H), 2.39 (s, 3H), 2.27 (s, 3H), 2.07 (m, 4H), 1.10 (s, 9H), 0.68 (t, 6H);

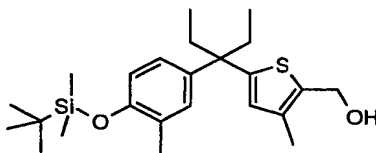
ES-MS: 508 (M+1).

Example 183

Preparation of (5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-yl)methylsulfanyl)-acetic acid ethyl ester.



A. (5-{1-[4-(tert-Butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-yl)-methanol.

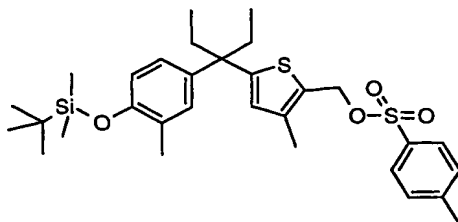


To a 0 °C solution of 5-{1-[4-(tert-butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophene-2-carboxylic acid methyl ester (10.0 g, 22.39 mmol) in THF (200 ml) is added portionwise lithium aluminum hydride (1.70 g, 44.78 mmol) and the reaction mixture is warmed to RT for 1 h. The reaction is quenched with water (1.7 ml), 5N NaOH (1.7 ml), and water (5.1 ml). The reaction mixture is filtered, concentrated and chromatographed (120 g SiO₂, 10% EtOAc/Hex) to yield the title compound (7.0 g, 75%).

¹NMR (400MHz, CDCl₃) δ 7.01 (d, 1H, J=2.2 Hz), 6.94 (dd, 1H, J=8.4, 2.2 Hz), 6.65 (d, 1H, J=8.4 Hz), 6.52 (s, 1H), 4.65 (d, 2H, J=4.8 Hz), 2.17 (s, 6H), 2.09-1.99 (m, 4H), 1.54 (t, 1H, J=5.5 Hz), 1.00 (s, 9H), 0.69 (t, 6H, J=7.3 Hz), 0.20 (s, 6H).

B. Toluene-4-sulfonic acid 5-{1-[4-(tert-butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-yl)methyl ester.

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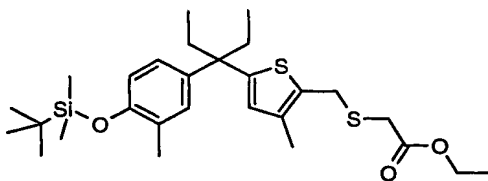


To a solution of (5-{1-[4-(tert-butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-yl)-methanol (1.0 g, 2.39 mmol) in Et₂O (5 ml) is added triethyl amine (666 μ l, 4.78 mmol). The mixture is added to a solution of p-toluenesulfonyl chloride (501 mg, 2.62 mmol) in Et₂O (5 ml) and stirred overnight. The reaction is filtered, concentrated and chromatographed (12 g SiO₂, 5% EtOAc/Hex) to yield the title compound (740 mg, 55%).

¹NMR (400MHz, CDCl₃) δ 7.93 (d, 2H, J=8.4 Hz), 7.41 (d, 2H, J=8.8 Hz), 7.00 (s, 1H), 6.93 (dd, 1H, J=8.4, 2.2 Hz), 6.63 (d, 1H, J=8.4 Hz), 6.48 (s, 1H), 4.49 (s, 2H), 2.49 (s, 3H), 2.15 (s, 3H), 2.09 (s, 3H), 2.05-2.00 (m, 4H), 0.99 (s, 9H), 0.67 (t, 6H, J=7.3 Hz), 0.19 (s, 6H).

EI-MS: 401.2

C. (5-{1-[4-(tert-Butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-ylmethylsulfanyl)-acetic acid ethyl ester.



To a solution of 2.68 M sodium ethoxide (507 μ l, 1.36 mmol) in EtOH (2 ml) is added ethyl 2-mercaptoacetate (149 μ l, 1.36 mmol) and stirred at RT for 30 m. The mixture is added a solution of toluene-4-sulfonic acid 5-{1-[4-(tert-butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-ylmethyl ester (740 mg, 1.29 mmol) in EtOH (2 ml) is added and refluxed for 15 m. The reaction is concentrated and partitioned between EtOAc (100 ml) and 0.2N HCl (50 ml). The

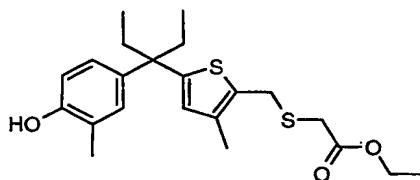
-317-

organic layer is washed with water (50 ml), dried (MgSO₄), concentrated, and chromatographed (12 g SiO₂, 5% EtOAc/Hex) to yield the title compound (180 mg, 27%).

¹NMR (400MHz, CDCl₃) δ 7.00 (d, 1H, J=2.2 Hz), 6.92 (dd, 1H, J=8.4, 2.2 Hz), 6.64 (d, 1H, J=8.4 Hz), 6.46 (s, 1H), 4.17 (q, 2H, J=7.2 Hz), 3.92 (s, 2H), 3.14 (s, 2H), 2.16 (s, 3H), 2.12 (s, 3H), 2.07-1.98 (m, 4H), 1.28 (t, 3H, J=7.0 Hz), 1.00 (s, 9H), 0.68 (t, 6H, J=7.3 Hz), 0.20 (s, 6H).

EI-MS: 538.2 (M+NH₄)

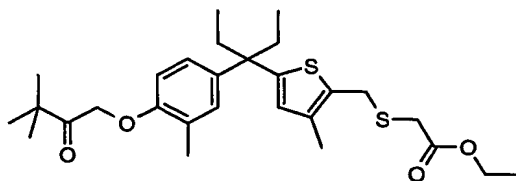
D. {5-[1-Ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophen-2-ylmethylsulfanyl}-acetic acid ethyl ester.



Using an analogous procedure to Example 12F, (5-{1-[4-(tert-Butyl-dimethyl-silanyloxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-ylmethylsulfanyl)-acetic acid ethyl ester (180 mg, 0.346 mmol) gives the title compound (147 mg, quant.).

¹NMR (400MHz, CDCl₃) δ 7.00 (s, 1H), 6.97 (d, 1H, J=7.9 Hz), 6.67 (d, 1H, J=8.4 Hz), 6.47 (s, 1H), 4.58 (s, 1H), 4.17 (q, 2H, J=7.2 Hz), 3.92 (s, 2H), 3.14 (s, 2H), 2.21 (s, 3H), 2.12 (s, 3H), 2.06-1.99 (m, 4H), 1.28 (t, 3H, J=7.0 Hz), 0.68 (t, 6H, J=7.3 Hz).

E. (5-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-1-ethyl-propyl}-3-methyl-thiophen-2-ylmethylsulfanyl)-acetic acid ethyl ester.



Using an analogous procedure to Example 134A, {5-[1-Ethyl-1-(4-hydroxy-3-methyl-phenyl)-propyl]-3-methyl-thiophen-2-ylmethylsulfanyl}-acetic acid ethyl ester (141 mg, 0.347 mmol) gives the title compound (145 mg, 83%).

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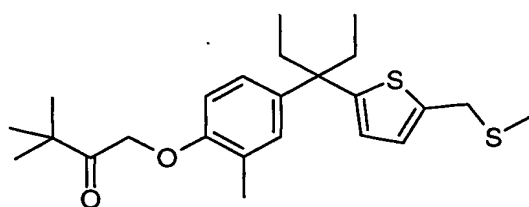
^1NMR (400MHz, CDCl_3) δ 7.02 (s, 1H), 7.00 (d, 1H, $J=8.4$ Hz), 6.51 (d, 1H, $J=8.4$ Hz), 6.46 (s, 1H), 4.83 (s, 2H), 4.17 (q, 2H, $J=7.2$ Hz), 3.92 (s, 2H), 3.14 (s, 2H), 2.25 (s, 3H), 2.12 (s, 3H), 2.08-1.97 (m, 4H), 1.30-1.19 (m, 12H), 0.67 (t, 6H, $J=7.3$ Hz).

EI-MS: 522.2 ($\text{M}+\text{NH}_4$).

5

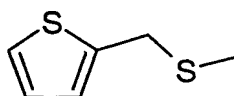
Example 184

Preparation of 3'-[4-(2-Oxo-3,3-dimethylbutoxy-3-methylphenyl)]-3'-[5-(methylmercaptylmethyl)thiophen-2-yl]pentane.



10

L. 2-(Methylmercaptylmethyl)-thiophene.

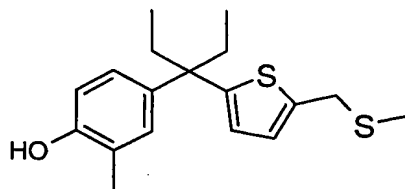


To a 25 °C solution of 2-hydroxymethyl thiophene (2.28 g, 20 mmol), and S-methyl-N,N'tetramethylisothiuronium iodide [(5.48 g, 20 mmol); [S. Fujisaki et al, Bull. Chem. Soc. Jpn., 58, 2429-30 (1985)] in anhydrous DMF (10 ml) under a N_2 atmosphere, is added NaH (1.44 g, 60 mmol, 2.40 g of 60% mineral oil dispersion) in small portions. After the resulting vigorous liberation of hydrogen ceases, hexane (10 ml) is added. After stirring for 1 h, the reaction is cooled to 0 °C and water (10 ml) is added dropwise. The mixture is extracted with hexane (3 X 50 ml). The combined extract is K_2CO_3 concentrated, and chromatographed with (Hex to 20% CHCl_3 /Hex) to give the title compound as a colorless liquid (2.4 g, 83%).

^1NMR (300MHz, CDCl_3) δ ppm: 2.10 (s, 3H), 3.92 (s, 2H), 6.95 (m, 2H), 7.23 (1H).

M. 3'-[4-(Hydroxy)-3-methylphenyl]-3'-[5-(methylmercaptylmethyl)thiophen-2-yl]pentane.

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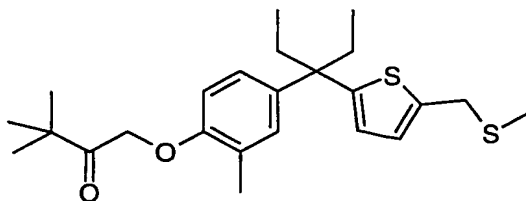
To a 0 °C mixture of 3'-[4-(hydroxy)-3-methylphenyl]pentan-3-ol (582 mg, 3.0 mmol) and 2-(methylmercaptylmethyl)-thiophene (2.16 g, 15.0 mmol) is added BF₃-Et₂O (171 mg, 0.15 ml, 1.20 mmol). After stirring for 30 m at 0 to 5 °C, the reaction is quenched with satd aq NaHCO₃ and is extracted with EtOAc (2X). The combined extract is washed with brine, Na₂SO₄ dried, concentrated, and chromatographed by radial chromatography (4 mm plate, 25% to 80% CHCl₃/Hex to give the title compound as a pale brown oil (695 mg, 72%).

¹NMR (300MHz, CDCl₃) δ ppm: 0.071 (t, J = 7.3 Hz, 6H), 2.06 (s, 3H), 2.07 (m, 4H), 2.23 (s, 3H), 3.82 (s, 3H), 4.52 (s, 1H), 6.60 to 6.75 (m, 3H), 6.96-7.05 (m, 2H).

TOF(+) MS m/z: 320.2; calc. for C₁₈H₂₄OS₂: 320.20.

ES (-) MS m/z 319.1, [M-H]; calc. for C₁₈H₂₃OS₂: 319.24.

C. 3'-[4-(2-Oxo-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-(methylmercaptylmethyl)-thiophen-2-yl]pentane.



To a mixture of 3'-[4-(hydroxy)-3-methylphenyl]-3'-[5-(methylmercaptylmethyl)-thiophen-2-yl]pentane (586 mg, 1.83 mmol), KI (122 mg, 0.73 mmol), 3,3-dimethyl-1-chloro-2-butanone (370 mg, 2.75 mmol) and DMF (10 ml) at 25 °C is added 60% NaH dispersion (92 mg, 2.29 mmol) in small portions. The reaction is stirred for 15 m and quenched with satd NaHCO₃ solution (50 ml). The mixture is extracted with EtOAc (2 X 50 ml) and the combined organic layer is washed with brine, Na₂SO₄ dried, and concentrated. The resulting oil is radial chromatographed (50% to 75% CHCl₃/Hex) to give the title product as a pale yellow oil (516 mg, 67%).

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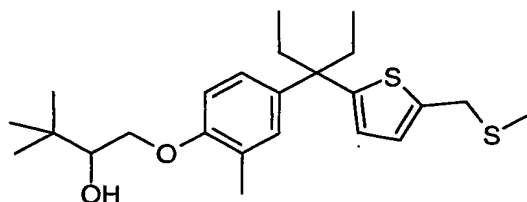
^1NMR (400MHz, DMSO-d_6) δ ppm: 0.64 (t, $J = 7.3$ Hz, 6H), 1.18 (s, 9H), 1.97 (s, 3H), 2.02 (m, 4H), 2.15 (s, 3H), 3.84 (s, 2H), 5.07 (s, 2H), 6.55 to 6.76 (m, 3H), 6.93 to 7.04 (m, 2H).

FAB(+) MS m/z [M-H]: 417.3; calc. for $\text{C}_{24}\text{H}_{34}\text{O}_2\text{S}_2$ (-H): 417.20

5 IR (CHCl_3): 1724.08 cm^{-1} .

Example 185

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-(methylmercaptylmethyl)-thiophen-2-yl]pentane.



10 To a $25\text{ }^\circ\text{C}$ solution of 3'-[4-(2-Oxo-3,3-dimethylbutoxy-3-methylphenyl)]-3'-[5-(methylmercaptylmethyl)thiophen-2-yl]pentane (90 mg, 0.22 mmol) in MeOH (10 ml) is added NaBH_4 (8.1 mg, 0.22 mmol). The reaction mixture is stirred overnight at ambient temperature. Then 1 ml of acetone is added, the reaction is concentrated and the residue

15 is distributed between H_2O and CH_2Cl_2 . The organic layer is washed with water, dried with anhydrous Na_2SO_4 , and concentrated to give the title compound as a colorless oil (90 mg, quant).

^1NMR (300MHz, CDCl_3) δ ppm: 0.63 (t, $J = 7.3$ Hz, 6H), 0.94 (s, 9H), 1.95-2.08 (m, 4H), 1.97 (s, 3H), 2.12 (s, 3H), 3.63 (m, 1H), 3.73 (s, 2H), 3.79 (dd, $J = 7.3, 10.2$ Hz, 1H), 4.02 (dd, $J = 3.4, 10.2$ Hz, 1H), 6.54 (m, 1H), 6.64 (m, 2H), 6.97 (m, 2H).

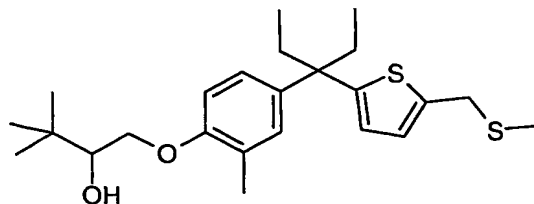
20 FAB(+) MS m/z [M-H]: 419.3; calc. for $\text{C}_{24}\text{H}_{36}\text{O}_2\text{S}_2$ (-H): 419.22.

ES (+) MS m/z 438.2, $[\text{MNH}_4^+]$; calc. for $\text{C}_{24}\text{H}_{40}\text{NO}_2\text{S}_2$: 438.24.

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Example 186A and Example 186B

Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy-3-methylphenyl)]-3'-[5-(methylmercaptymethyl)-thiophen-2-yl]pentane.



5 A racemic mixture of 3'-[4-(2-oxo-3,3-dimethylbutoxy-3-methylphenyl)]-3'-[5-(methylmercaptymethyl)thiophen-2-yl]pentane (76 mg) is chromatographed with a Chiralcel AD column to give enantiomer 1, Example 186A (28 mg, 37%) and enantiomer 2, Example 186B (22 mg, 29%).

Enantiomer 1, Example 186A

10 HPLC: Chiralcel AD (4.6X250 mm); 40% IPA/60% heptane; 1 ml/m (flow rate); rt = 4.21 m; 225 nm; ee 100% by HPLC.

FAB(+) MS m/z [M-H]: 419.3; calc. for C₂₄H₃₆O₂S₂ (-H): 419.22.

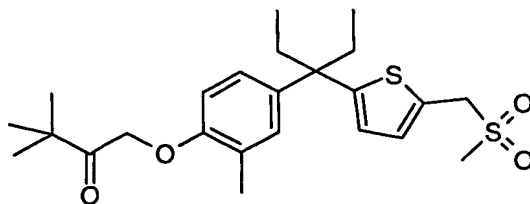
Enantiomer 2, Example 186B

15 HPLC: Chiralcel AD (4.6X250 mm); 40% IPA/60% heptane; 1 ml/m (flow rate); rt = 5.67 m; 225 nm; ee 100% by HPLC.

FAB(+) MS m/z [M-H]: 419.3; calc. for C₂₄H₃₆O₂S₂ (-H): 419.22.

Example 187

Preparation of 3'-[4-(2-oxo-3,3-dimethylbutoxy-3-methylphenyl)]-3'-[5-(methylsulphonylmethyl)-thiophen-2-yl]pentane.



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Using a procedure analogous to Example 9C, 3'-[4-(2-oxo-3,3-dimethylbutoxy-3-methylphenyl)]-3'-[5-(methylmercaptymethyl)-thiophen-2-yl]pentane gives the title compound as a pale yellow oil (287 mg, 85%).

¹NMR (300MHz, CDCl₃) δ ppm: 0.71 (t, J = 7.3 Hz, 6H), 1.28 (s, 9H), 2.04-2.25 (m, 4H), 2.27 (s, 3H), 2.79 (s, 3H), 4.37 (s, 2H), 4.86 (s, 2H), 6.53 (d, J = 8.3 Hz, 1H), 6.76 (d, J = 3.6 Hz, 1H), 6.99 to 7.02 (m, 3H).

FAB(+) MS m/z: 452.3; calc. for C₂₄H₃₄O₄S₂: 450.19.

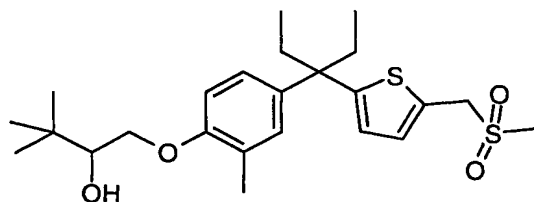
ES (+) MS m/z 468.2, [MNH₄⁺]; calc. for C₂₄H₃₈NO₄S₂: 468.22.

IR (CHCl₃): 1725.04 cm⁻¹.

UV (EtOH): 227 nm (e = 17500), 255 nm (shoulder, e = 10,000).

Example 188

Preparation of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-(methylsulfonylmethyl)-thiophen-2-yl]pentane.



Using a procedure analogous to Example 2, 3'-[4-(2-oxo-3,3-dimethylbutoxy-3-methylphenyl)]-3'-[5-(methylsulfonylmethyl)-thiophen-2-yl]pentane gives the title compound as a colorless oil (188 mg, 94%).

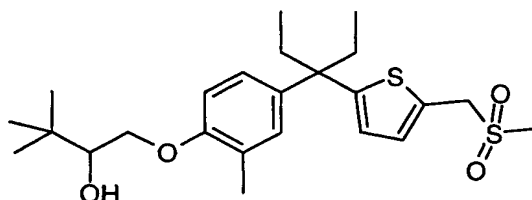
¹NMR (400MHz, CDCl₃) δ ppm: 0.67 (t, J = 7.3 Hz, 6H), 1.04 (s, 9H), 2.12 (m, 4H), 2.22 (s, 3H), 2.14 (s, 3H), 2.80 (s, 3H), 3.72 (m, 1H), 3.99 (m, 1H), 4.12 (dd, J = 2.9, 9.8 Hz, 1H), 4.36 (s, 2H), 6.74 (d, J = 8.3 Hz, 1H), 6.78 (d, J = 3.6 Hz, 1H), 6.96 to 7.08 (m, 3H).

FAB(+) MS m/z: 452.3; calc. for C₂₄H₃₆O₄S₂: 452.21.

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Example 189A and Example 189B:

Preparation of enantiomers of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-(methylsulfonylmethyl)-thiophen-2-yl]pentane.



- 5 A racemic mixture of 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-(methylsulfonylmethyl)-thiophen-2-yl]pentane (174 mg) is chromatographed (Chiralcel AD column) to give enantiomer 1, Example 189A (78 mg, 43%) and enantiomer 2, Example 189B (86 mg, 49%).

Enantiomer 1, Example 189A

- 10 HPLC: Chiralcel AD (4.6X250 mm); 40% IPA/60% heptane; 1 ml/m (flow rate); rt = 5.75 m; 240 nm; ee = 99.8%.

FAB(+) MS m/z: 452.3; calc. for C₂₄H₃₆O₄S₂: 452.21.

ES (+) MS m/z 470.1, [MNH₄⁺]; calc. for C₂₄H₄₀NO₄S₂: 470.24.

- 15 Enantiomer 2, Example 189B

HPLC: Chiralcel AD (4.6X250 mm); 40% IPA/60% heptane; 1 ml/m (flow rate); rt = 7.75 m; 260 nm; ee = 99.6%.

FAB(+) MS m/z: 452.3; calc. for C₂₄H₃₆O₄S₂: 452.21.

ES (+) MS m/z 470.1, [MNH₄⁺]; calc. for C₂₄H₄₀NO₄S₂: 470.24.

20

Method of Making the Compounds used in the Method of the Invention

Scheme 1: synthesis of Phenyl-thiophene acids.

- 25 Bromophenol 1 is O-silylated with TBSCl and treated with Mg/THF at reflux to form the corresponding Grignard reagent. Condensation of the Grignard reagent with the 3-pentanone provides tertiary alcohol 2. Tertiary alcohol 2 is condensed with 3-methylthiophene and boron trifluoride etherate to yield scaffold 3. Scaffold 3 is O-benzylated with NaH/benzyl bromide to give benzyl ether 4. Benzyl ether 4 is reacted

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with nBuLi and chloromethyl formate to give methyl ester 5. Methyl ester 5 is debenzylated with palladium on carbon/hydrogen to yield phenol 6. Phenol 6 is alkylated with sodium hydride and bromopinacolone to give ketone 7. Ketone 7 is reduced with sodium borohydride/MeOH to yield alcohol 8. Alcohol 8 is treated with potassium hydroxide/EtOH at 70 °C to give acid 9. Acid 9 is resolved with a ChiralPak AD column to give enantiomer 1 (9A) and enantiomer 2 (9B). Alternatively, alcohol 8 is resolved with a ChiralPak AD column to give enantiomer 1 (8A) and enantiomer 2 (8B). Enantiomer 1 (8A) and enantiomer 2 (8B) are converted to enantiomer 1 (9A) and enantiomer 2 (9B) with KOH/EtOH, respectively.

Scheme 2: synthesis of phenyl-thiophene amides.

Acid 9 is converted to amide 10 by treatment with 1) diphenylphosphoryl azide/triethyl amine, DMAP and 2) appropriate amine HNR₁R₂.

Scheme 3: synthesis of phenyl-thiophene amide-acids.

Acid 9 is reacted with EDCI/(N-methylmorpholine or Et₃N)/(HOBT or HOAT)/a substituted glycine ester to give amide-ester 11. Amide-ester 11 is hydrolyzed with LiOH/H₂O/THF to yield amide-acid 12.

Scheme 4: synthesis of phenyl-3-unsubstituted thiophene.

Ester 13 is reacted with EtMgBr/Et₂O to give tertiary alcohol 14. Tertiary alcohol 14 is treated with nBuLi (2 eq) and CO₂ (g) to yield acid 15. Acid 15 is dehydrated and esterified with MeOH/HCl (g) to give a mixture of olefinic ester 16. Olefinic ester 16 is reacted with o-cresol and BF₃-Et₂O to yield phenol 17. Phenol 17 is treated with NaH/DMF and 1-chloropinacolone/KI to give ketone 18. Ketone 18 is reacted with NaBH₄/MeOH and KOH/EtOH to yield acid 19. Alternatively, Phenol 17 (step 5 of scheme 4) is treated with K₂CO₃/ACN/KI catalyst to give ketone 18.

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Scheme 5: synthesis of phenyl-thiophene sulfones.

Methyl ester 5 is reacted with LAH/THF/45 °C to give alcohol 20. Alcohol 20 is treated with PBr₃ and then sodium alkyl thiolate to afford sulfide 21. Sulfide 21 is oxidized with mCBPA to yield sulfone 22. Sulfone 22 is hydrogenolyzed with Pd-C/H₂ to give phenol 23. Phenol 23 is reacted with NaH/DMF and 1-bromopinacolone to afford ketone 24. Ketone 24 is reduced with NaBH₄/MeOH to yield alcohol 25.

Scheme 6: synthesis of pentan-3-ol phenyl-thiophene amide-acids.

Phenol 3 is reacted with Tf₂O and pyridine to give triflate 26. Triflate 26 is methoxy carbonylated with Pd(OAc)₂/(DPPF or DPPB)/CO (g)/MeOH/Et₃N/(DMF or DMSO) at 80-100 °C to yield ester 27. Ester 27 is treated with LAH/THF to afford alcohol 28. Alcohol 28 is reacted with PBr₃ to give bromide 29. Bromide 29 is reacted with the lithium enolate of pinacolone to yield ketone 30. Ketone 30 is treated with NaBH₄/MeOH and TBSOTf/2,6-methylpyridine to give silyl ether 31. Silyl ether 31 is reacted with nBuLi/THF and methyl chloroformate to afford ester 32. Ester 32 is desilylated with aq HF to yield alcohol 32A. Alcohol 32A is hydrolyzed with aq KOH/EtOH/70 °C to afford acid 32B. Acid 32B is coupled with EDCI/(N-methylmorpholine or Et₃N)/(HOBT or HOAT)/a substituted glycine ester to give amide-ester 32C. Amide-ester 32C is hydrolyzed with LiOH/H₂O/THF to yield amide-acid 32D.

Scheme 7: synthesis of pentan-3-ol thiophene phenyl sulfonates.

Alcohol 20 is reacted with PBr₃ to give bromide 33. Bromide 33 is reacted with the lithium enolate of pinacolone to afford ketone 34. Ketone 34 is hydrogenolyzed with Pd-C/H₂ to yield phenol 35. Phenol 35 is sulfonated with a substituted alkyl sulfonyl chloride to give sulfonate 36. Sulfonate 36 is reduced with NaBH₄/MeOH to yield

alcohol 37. Alcohol 37 is treated with dilute aq LiOH/MeOH/dioxane to give sulfonate-acids 38.

5 Scheme 8: synthesis of pentan-3-ol thiophenyl phenyl sulfonamides.

Phenol 20 is treated with Tf₂O/pyridine and Pd(OAc)₂/(DPPF or DPPB)/CO (g)/MeOH/Et₃N/(DMF or DMSO) at 80-100 °C to give ester 39. Ester 39 is reacted with NaBH₄/MeOH and NaH/BnBr to afford benzyl ether 40. Benzyl ether 40 is hydrolyzed
10 with KOH/EtOH/80 °C to yield acid 41. Acid 41 is reacted diphenyl phosphoryl azide/Et₃N and tBuOH/90 °C to afford Boc-amine 42. Boc-amine 42 is treated with TFA/anisole to give aniline 43. Aniline 43 is subjected to R₃SO₂Cl/pyridine and Pd-C/H₂ to afford sulfonamide 44. Sulfonamide 44 is hydrolyzed with aq LiOH/MeOH to yield sulfonamide-acid 45.

15

Scheme 9: synthesis of α -methylated pinacolol phenyl-thiophene acids and amide acids.

Ester 7 is treated with LiHMDS; MeI and NaBH₄/MeOH to give alcohol 46. Alcohol 46
20 is reacted with KOH/EtOH/heat to afford acid 47. Acid 47 is coupled with EDCI/(N-methylmorpholine or Et₃N)/(HOBT or HOAT)/a substituted glycine ester to give amide-ester 48. Amide-ester 48 is hydrolyzed with LiOH/H₂O/THF to yield amide-acid 49.

25 Scheme 10: synthesis of tertiary alcohol phenyl-thiophene acids and amide-acids.

Phenol 3 is reacted with NaH/DMF and 1-bromopinacolone to give ketone 50. Ketone 50 is treated with MeMgBr/Et₂O to afford tertiary alcohol 51. Tertiary alcohol 51 reacted with s-BuLi (2.5 eq) and CO₂ (g) to give acid 52. Acid 52 is coupled with EDCI/(N-methylmorpholine or Et₃N)/(HOBT or HOAT)/a substituted glycine ester to give amide-
30 ester 53. Amide-ester 53 is hydrolyzed with LiOH/H₂O/dioxane to yield amide-acid 54.

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Alternatively, Phenol 3 may be reacted with K_2CO_3 and KI catalyst in place of NaH/DMF to give ketone 50.

Scheme 11: synthesis of cis-pentynol phenyl-thiophene acids and amide-acids.

5

Phenol 3 is reacted with TBSCl/imidazole. To give silyl ether 55. Silyl ether 55 is treated with n-BuLi/THF and methyl chloroformate to afford ester 56. Ester 56 is reacted with TBAF/THF and Tf₂O/pyridine to yield triflate 57. Triflate 57 is coupled with TMS-acetylene/Et₃N/DMF/Pd(PPh₃)₂Cl₂ and desilylated with TBAF/THF to give acetylene 58. Acetylene 58 is treated with Zn(OTf)₂Et₃N//t-butyl aldehyde/chiral auxiliary (with or without) to give alcohol 60. Alternatively, Acetylene 58 is reacted with LiHMDS/ketone 59 to give alcohol 60. Alcohol 60 is hydrolyzed with KOH/EtOH to afford acid 61.

10

Optionally, the acetylenic bond may be hydrogenated by conventional methods.

15

Scheme 12: synthesis of cis-pentenol phenyl-thiophene acids and amide-acids.

Alcohol 60 is treated with Lindlar's catalyst/H₂ and KOH/EtOH to yield acid 62.

20

Scheme 13: synthesis of trans-pentenol phenyl-thiophene acids and amide-acids.

Phenol 3 is reacted with Tf₂O/pyridine to give triflate 63. Triflate 63 is coupled with TMS-acetylene/Et₃N/DMF/Pd(PPh₃)₂Cl₂ and desilylated with TBAF/THF to give acetylene 64. Acetylene 64 is treated with Zn(OTf)₂/t-butyl aldehyde/chiral auxiliary (with or without) to give alcohol 65. For tertiary alcohols, acetylene 64 is reacted with LiHMDS/ketone 59 to give alcohol 65. Alcohol 65 is reduce with LAH or DiBAH to afford trans-pentenol 66. Trans-pentenol 66 is treated with s-BuLi (2.5 eq) and CO₂ (g) to give acid 67.

25

30

Scheme 14: synthesis of pentynol thiophenyl-pheny acids.

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Phenol 3 is reacted with DPTBSCl/imidazole. to give silyl ether 68. Silyl ether 68 is reacted with n-BuLi/THF and iodine to afford iodide 69. Iodide 69 is coupled with TMS-acetylene/Et₃N/DMF/Pd(PPh₃)₂Cl₂ and desilylated with TBAF/THF to give acetylene 70. Acetylene 70 is treated with Zn(OTf)₂/t-butyl aldehyde/chiral auxiliary (with or without) to give alcohol 71. For tertiary alcohols, acetylene 70 is reacted with LiHMDS/ketone 59 to give alcohol 71. Alcohol 71 is subjected to TBAF/THF and Tf₂O/pyridine to yield triflate 72. Triflate 72 is methoxycarbonylated with Pd(OAc)₂/(DPPF or DPPB)/CO (g)/MeOH/Et₃N/(DMF or DMSO) at 80-100 °C to give ester 73. Ester 73 is hydrolyzed with KOH/EtOH to afford acid 74. Optionally, the acetylenic bond may be hydrogenated by conventional methods.

Scheme 15: synthesis of cis-pentenol thiophenyl-phenyl acids.

Acid 74 is reduced with Lindlar's catalyst/H₂ to give acid 75.

Scheme 16: synthesis of trans-pentenol thiophenyl-phenyl acids.

Acetylene 71 is reduced with LAH or DiBALH to give trans-pentenol 76. Trans-pentenol 76 is treated with TBAF/THF and Tf₂O/pyridine to afford triflate 77. Triflate 77 is methoxycarbonylated with Pd(OAc)₂/(DPPF or DPPB)/CO (g)/MeOH/Et₃N/(DMF or DMSO) at 80-100 °C to give an ester which is hydrolyzed with KOH/EtOH to afford acid 78.

Scheme 17: synthesis of phenyl-thiophenyl acid mimics.

Acid 9 is coupled with EDCI/H₂NSO₂R₃/DMAP to give acyl-sulfonamide 79.

Acid 9 is coupled with EDCI/5-aminotetrazole/DMAP to give acyl-aminotetrazole 80.

For tetrazole 83, acid 9 is reacted with formamide/NaOMe at 100 °C to afford amide 81.

Amide 81 is treated with trifluoroacetic acid and methylene chloride followed by 2-

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chloro-1,3-dimethyl-2-imidazolinium hexafluorophosphate to give nitrile 82. Nitrile 82 is reacted with sodium azide and triethylammonium hydrochloride in N-methylpyrrolidin-2-one to afford tetrazole 83.

5 Scheme 18: synthesis of phenyl-thiophenyl acid analogs.

Alcohol 20 is reacted with Pd-C/H₂ to give phenol 84. Phenol 84 is treated with NaH/DMF (1.0 eq) and 1-bromopinacolone to afford ketone 85. Ketone 85 is reacted with PBr₃ to afford bromide 86. Bromide 86 is couple with KCN/DMF to give nitrile 87. Nitrile 87 is reduced with NaBH₄/MeOH to yield alcohol 88. Alcohol 88 is reacted with
10 KOH/H₂O/dioxane/heat to give acid 89. Acid 89 is coupled with EDCI/5-aminotetrazole/DMAP to give acyl-aminotetrazole 90.

Scheme 19: synthesis of additional phenyl-thiophene acid analogs.

Alcohol 88 is reacted with NaN₃/Et₃N-HCl/NMP at 150 C to afford tetrazole 91.
15 Bromide 86 is treated with the sodium enolate of dimethyl malonate and KOH/EtOH/heat to give propionic acid 93. Acid 93 is reduced with NaBH₄/MeOH to give 93A.

Scheme 20: synthesis of pentan-3-ol thiophenyl phenyl oxyacetic acid.

Phenol 35 is reacted with K₂CO₃/BrCH₂CO₂Me to give oxyacetate 94. Oxyacetate is
20 hydrolyzed with aq LiOH/MeOH/dioxane to yield oxyacetic acid 95. Oxyacetic acid 95 is reduced with NaBH₄/MeOH to afford alcohol-oxyacetic acid 96.

Scheme 21: synthesis of pentan-3-ol phenyl thiophene propionic acid.

Silyl ether 31 is reacted with n-BuLi/THF and bromine to give bromide 97. Bromide 97
25 is coupled with BrZnCH₂CH₂CO₂Et/Pd(DPPF)Cl₂/THF/heat to afford ester 98. Ester 98 is reacted with aq LiOH/MeOH and TBAF/THF to yield propionic acid 99.

Scheme 22: synthesis of pentan-3-ol thiophenyl phenyl propionic acid.

Phenol 35 is reacted with Tf₂O/pyridine to give triflate 100. Triflate 100 is coupled with
30 BrZnCH₂CH₂CO₂Et/Pd(DPPF)Cl₂/THF/heat to afford ester 101. Ester 101 is reacted with aq LiOH/MeOH/dioxane and NaBH₄/MeOH to yield propionic acid 102.

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Scheme 23: Improved synthesis of phenyl thiophene derivatives.

Acid 103 is esterified with MeOH/HCl (g) and reacted with EtMgBr (6 eq) to give alcohol 104. Alcohol 104 is coupled with 3-methylthiophene and BF₃-OEt₂ to afford phenol 3. Phenol 3 is treated with TBSCl/imidazole, to yield silyl ether 55. Silyl ether 55 is reacted
5 with nBuLi and methyl chloroformate to give ester 56. Ester 56 is sequentially reacted with 6) TBAF; 7) 1-bromopinacolone/K₂CO₃; 8) NaBH₄; and 9) KOH to afford acid 9.

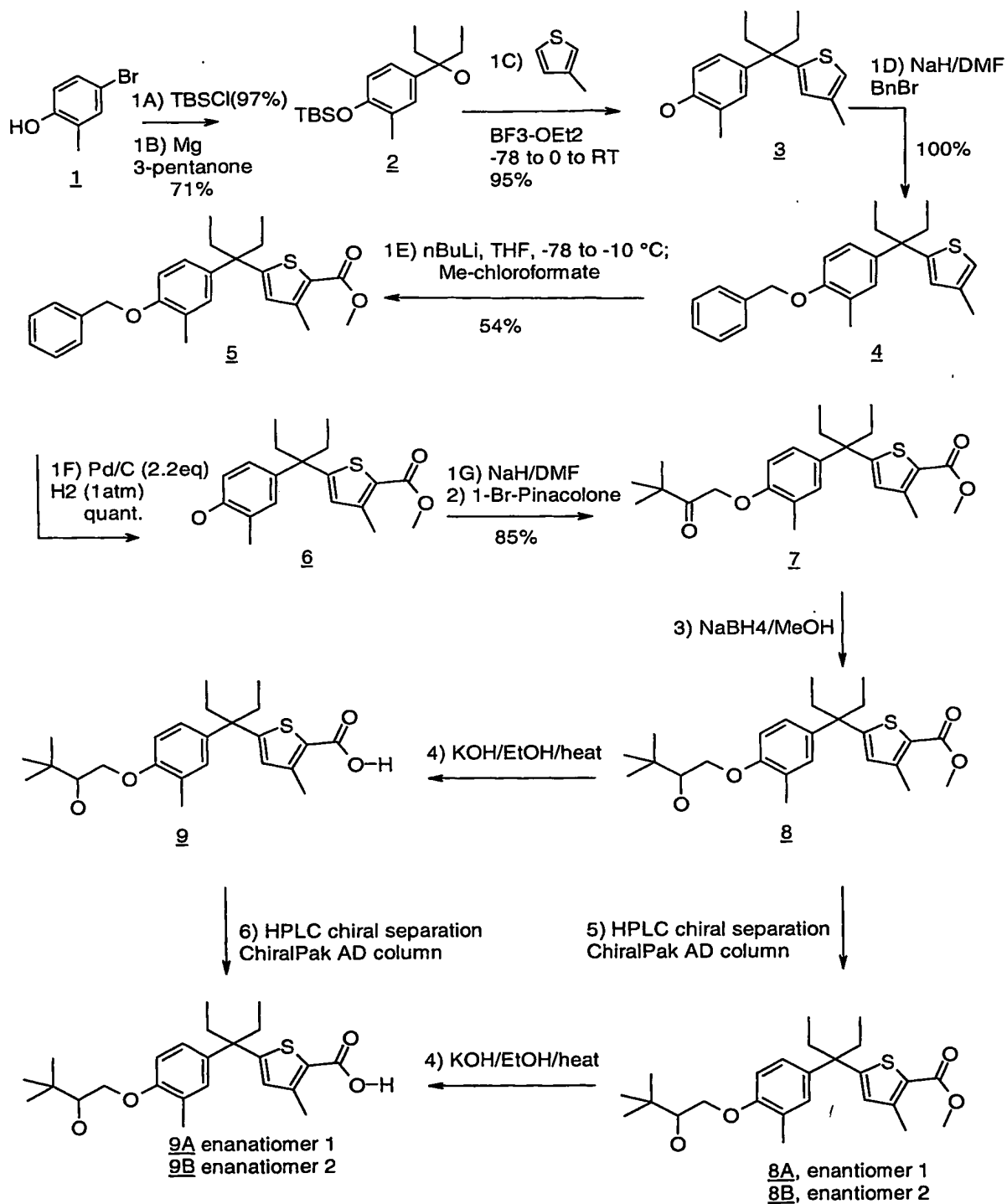
Scheme 24: Synthesis of phenyl-3-unsubstituted-thiophene sulfones and sulfides.

Commercially available 2-hydroxymethyl thiophene is reacted with NaH (3 eq) and S-methyl-N,N'-tetramethylisothiuronium iodide to give 2-(methylmercaptylmethyl)-
10 thiophene (105). Compound (105) is coupled with alcohol (104) and BF₃-OEt₂ to afford phenol 106. Phenol 106 is reacted with NaH/DMF and 1-chloropinacolone/KI to provide ketone 107. The sulfide moiety of 107 is oxidized with mCPBA to yield sulfone 108. Compound 108 is reacted with NaBH₄/MeOH to yield sulfone-alcohol 109. In addition,
15 ketone 107 is reduced by NaBH₄/MeOH to yield the sulfide-alcohol 110.

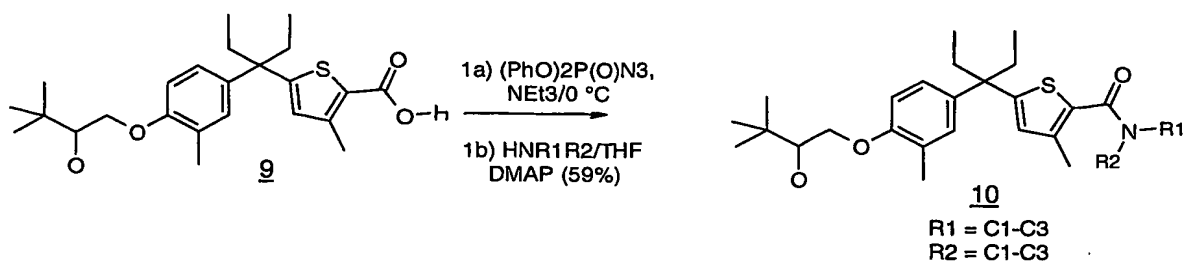
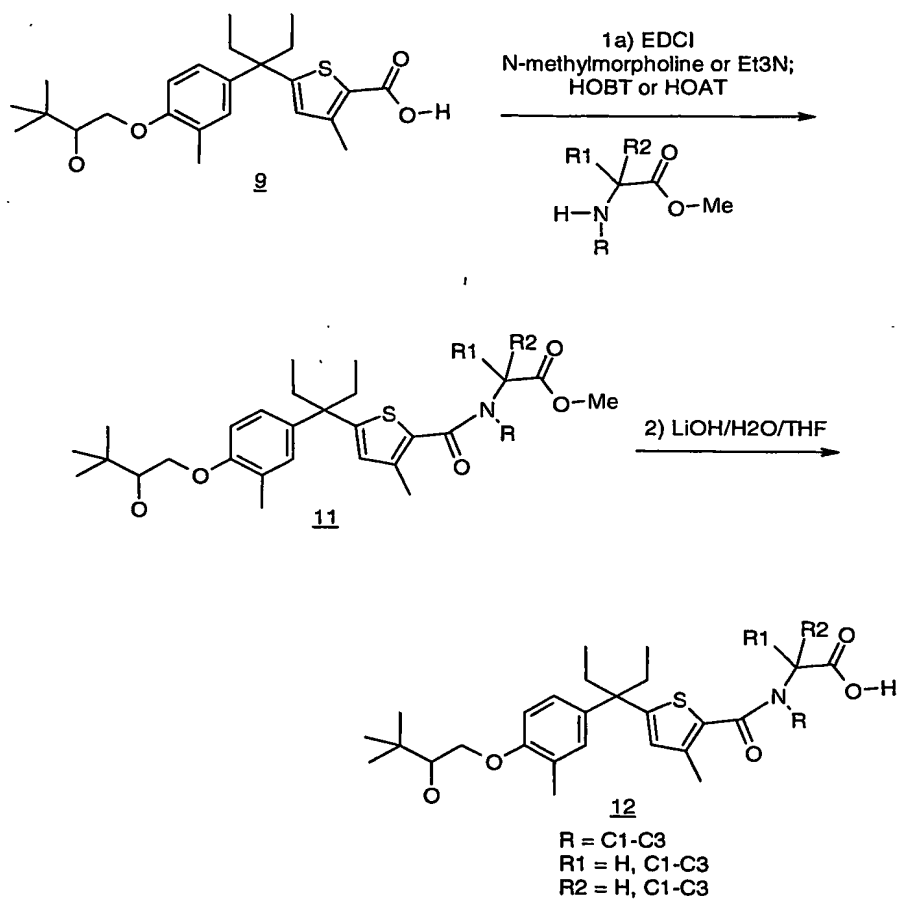
Scheme 25: Preparation of sulfonyl aminoalkylcarboxylic acids.

Silyl ether 55 is reacted with nBuLi/THF followed by sulfonyl chloride to give sulfonyl chloride 111. Sulfonyl chloride 111 is reacted with allyl amine to yield a sulfonamide 112.
20 Sulfonamide 112 is alkylated with K₂CO₃/BrCH₂CO₂Me to afford ester 113. Ester 113 is reacted sequentially with 1) HF/H₂O/acetonitrile; 2) K₂CO₃/1-chloropinacolone to give ketone-ester 114. Ketone-ester 114 is treated with 1) Pd(PPh₃)₄/N,N-dimethyl barbituric acid; 2) NaBH₄/MeOH; aq LiOH/dioxane to yield sulfonamide-acid 115.

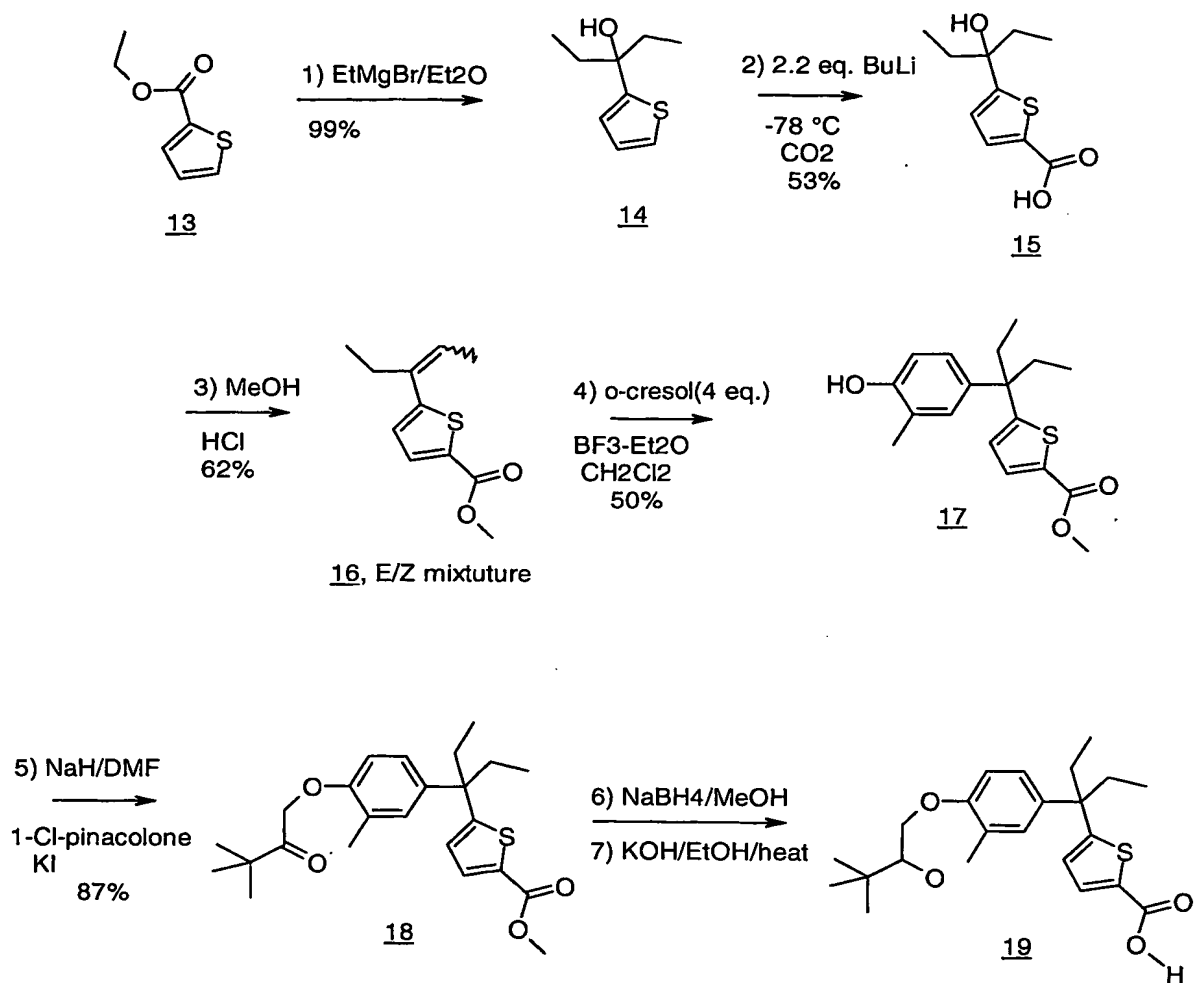
Scheme 1: Synthesis of Phenyl-Thiophene Acids



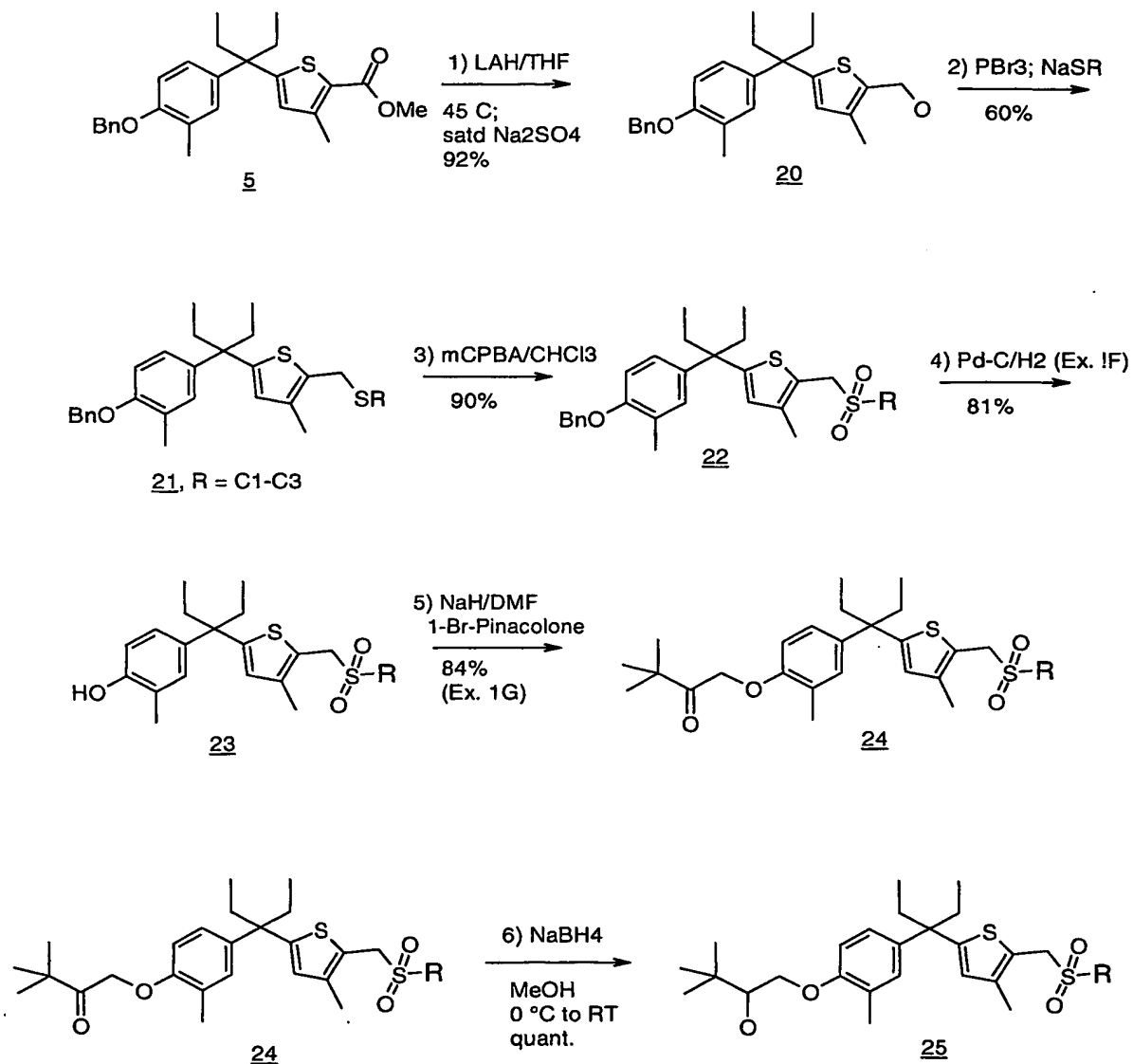
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Scheme 2: Synthesis of Phenyl-Thiophene Amides Amide-Acids**Scheme 3: Synthesis of Phenyl-Thiophene Amide-Acids**

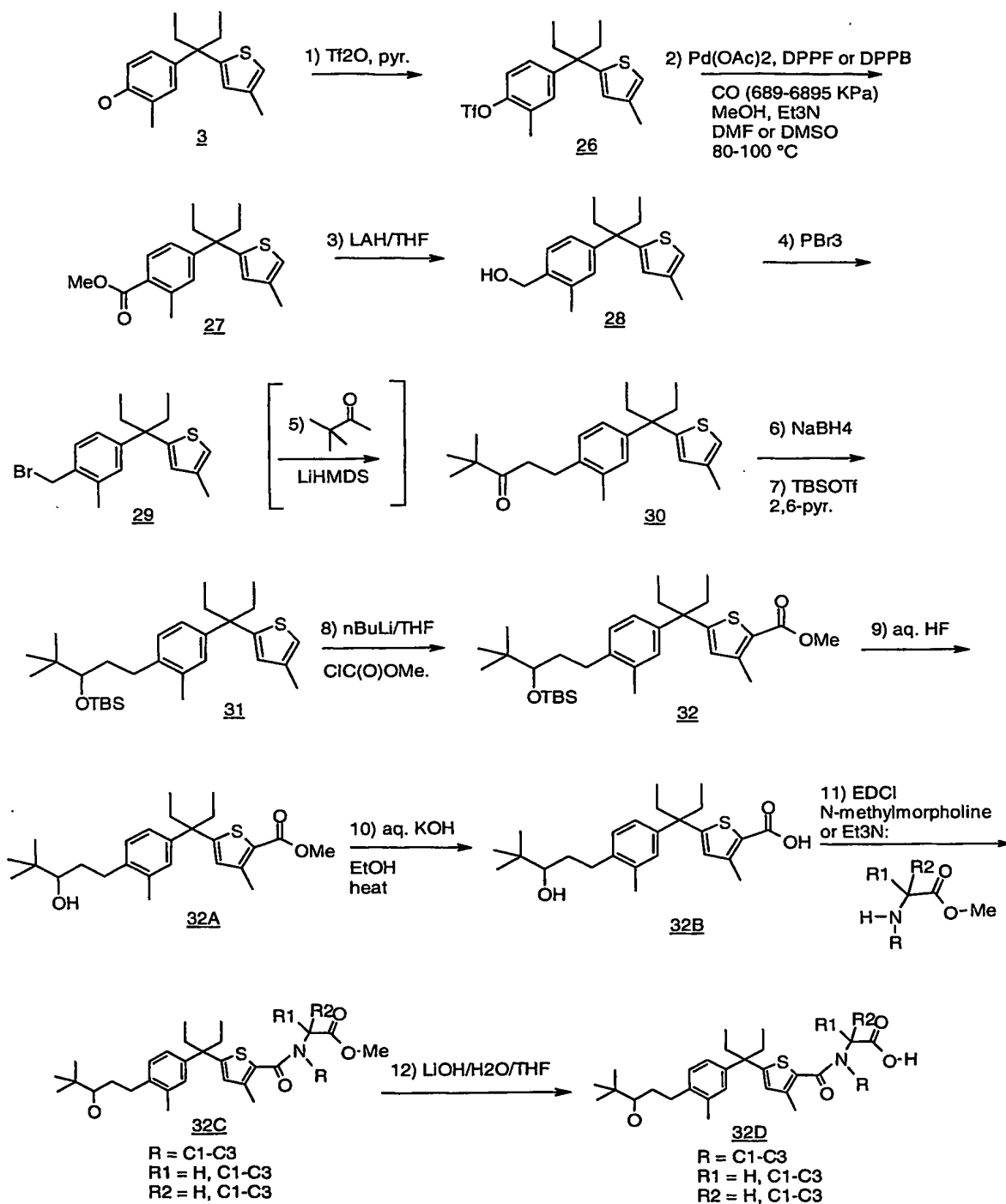
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Scheme 4: Synthesis of Phenyl-3-Unsubstituted Thiophene

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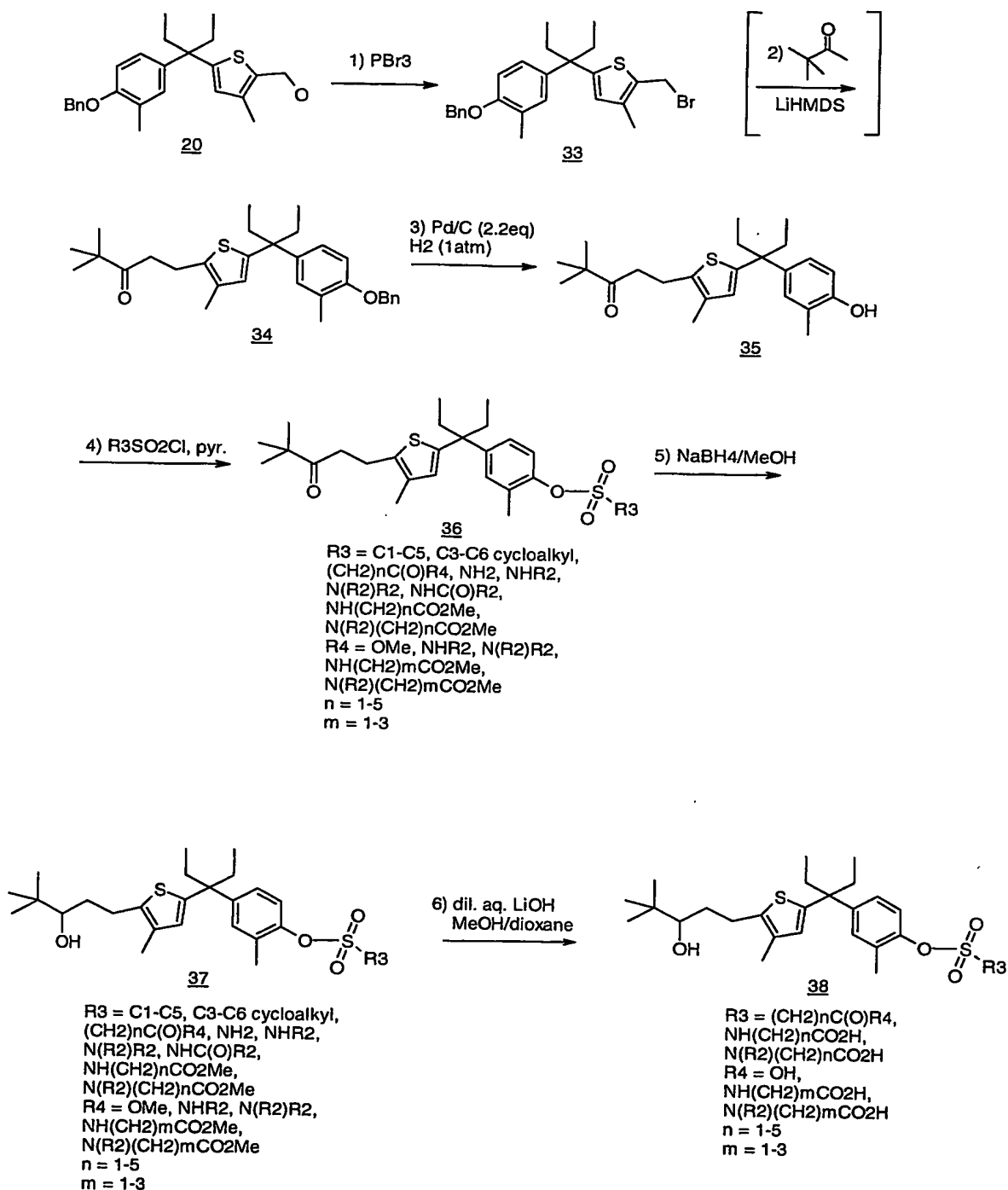
Scheme 5: Synthesis of Phenyl-Thiophene Sulfones

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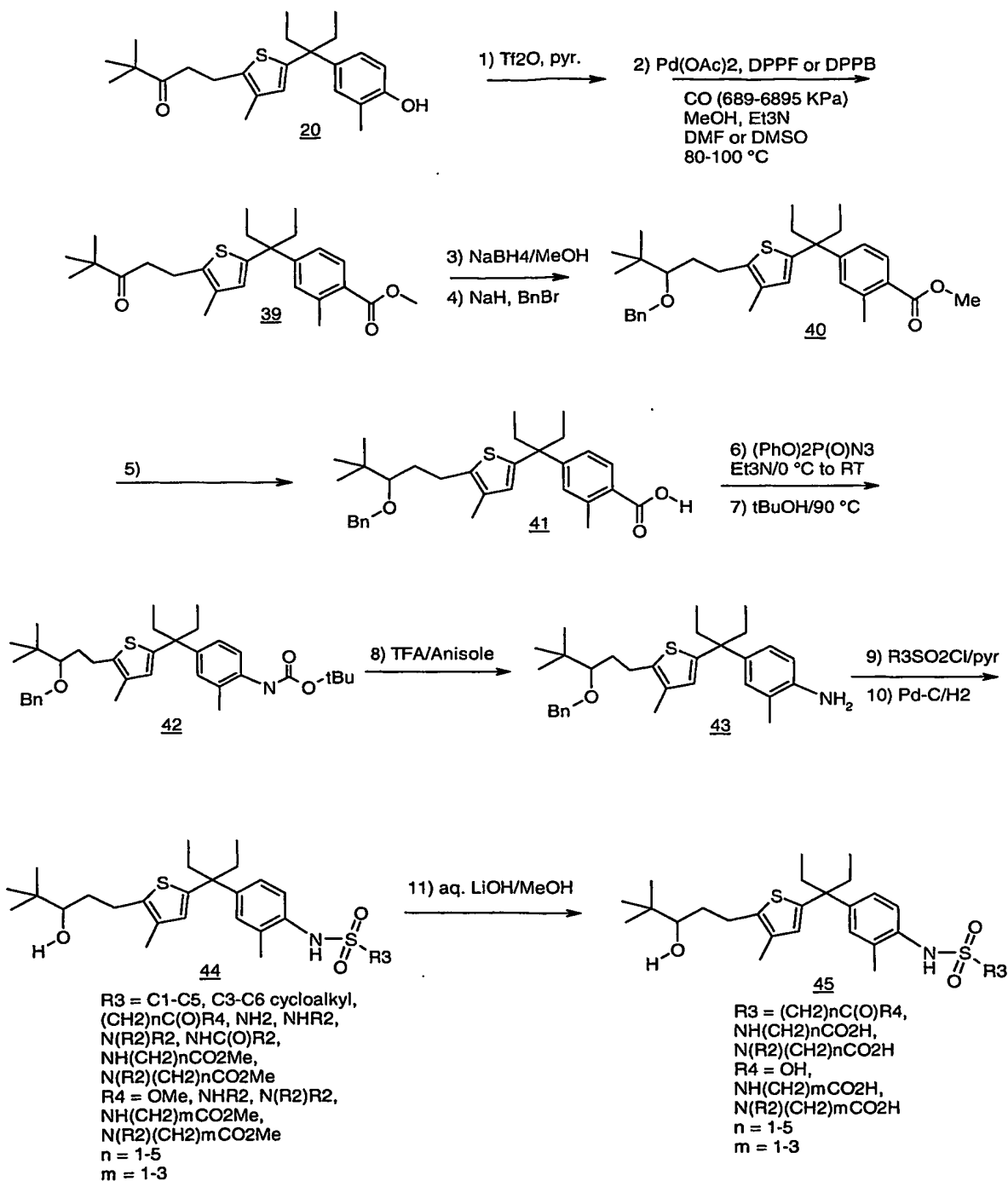
Scheme 6: Synthesis of Pentan-3-ol Phenyl-Thiophene Amide-Acids

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Scheme 7: Synthesis of Petan-3-ol Thiophenyl Phenyl Sulfonates

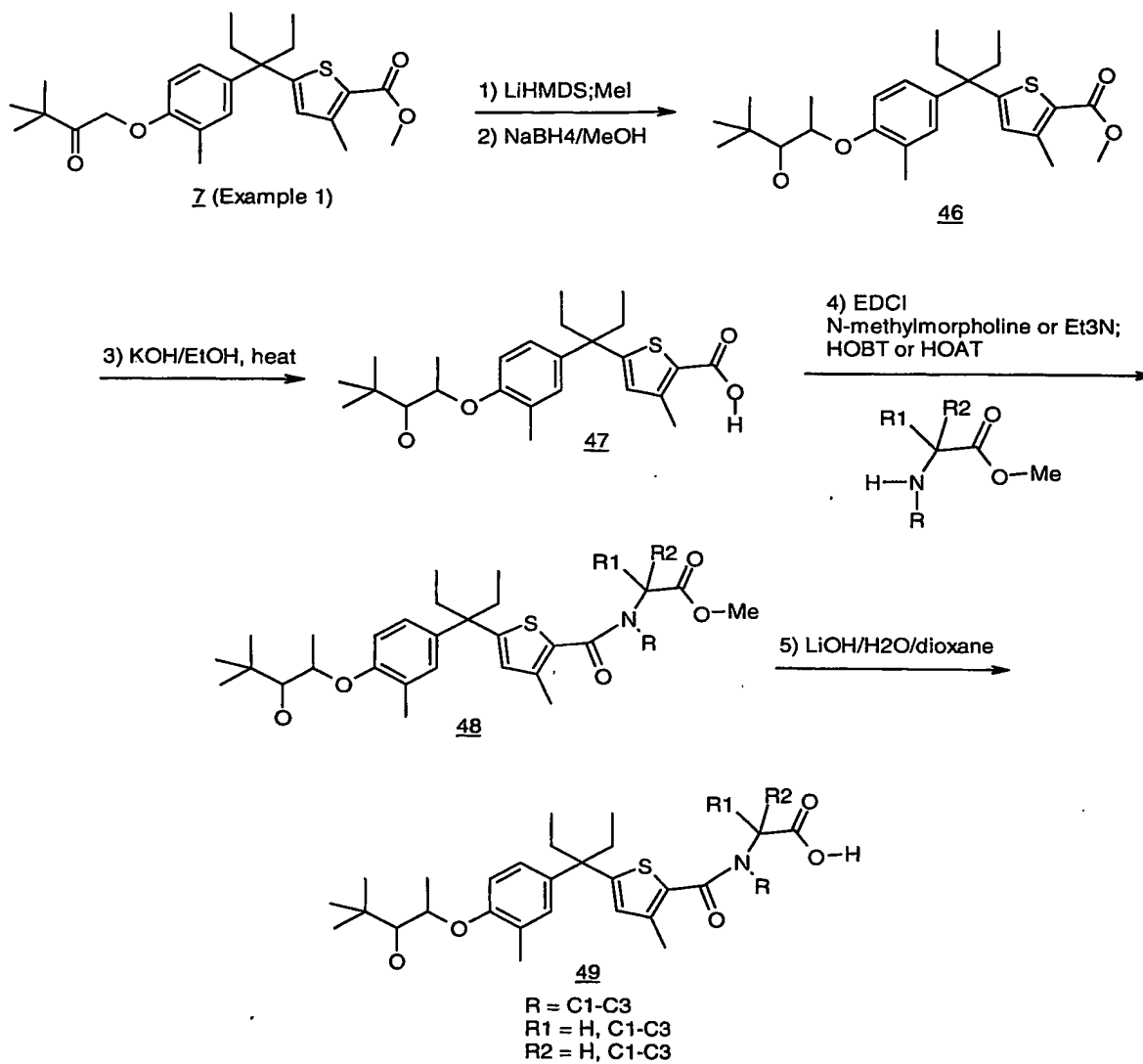


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Scheme 8: Synthesis of Pentan-3-ol Thiophenyl Phenyl Sulfonamides

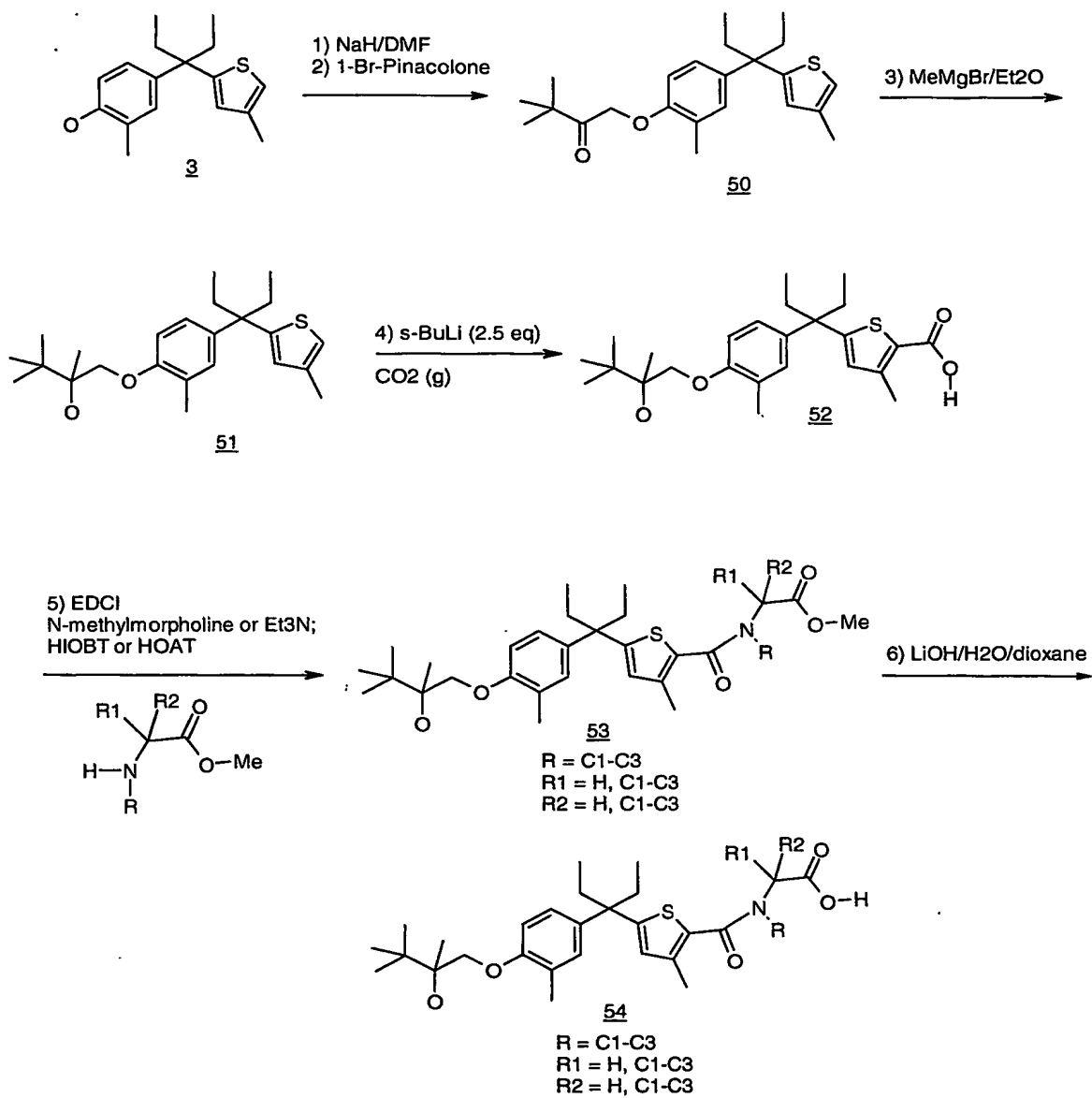
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Scheme 9: Synthesis of α -Methylated Pinacolol
Phenyl-Thiophene Acids & Amide-Acids



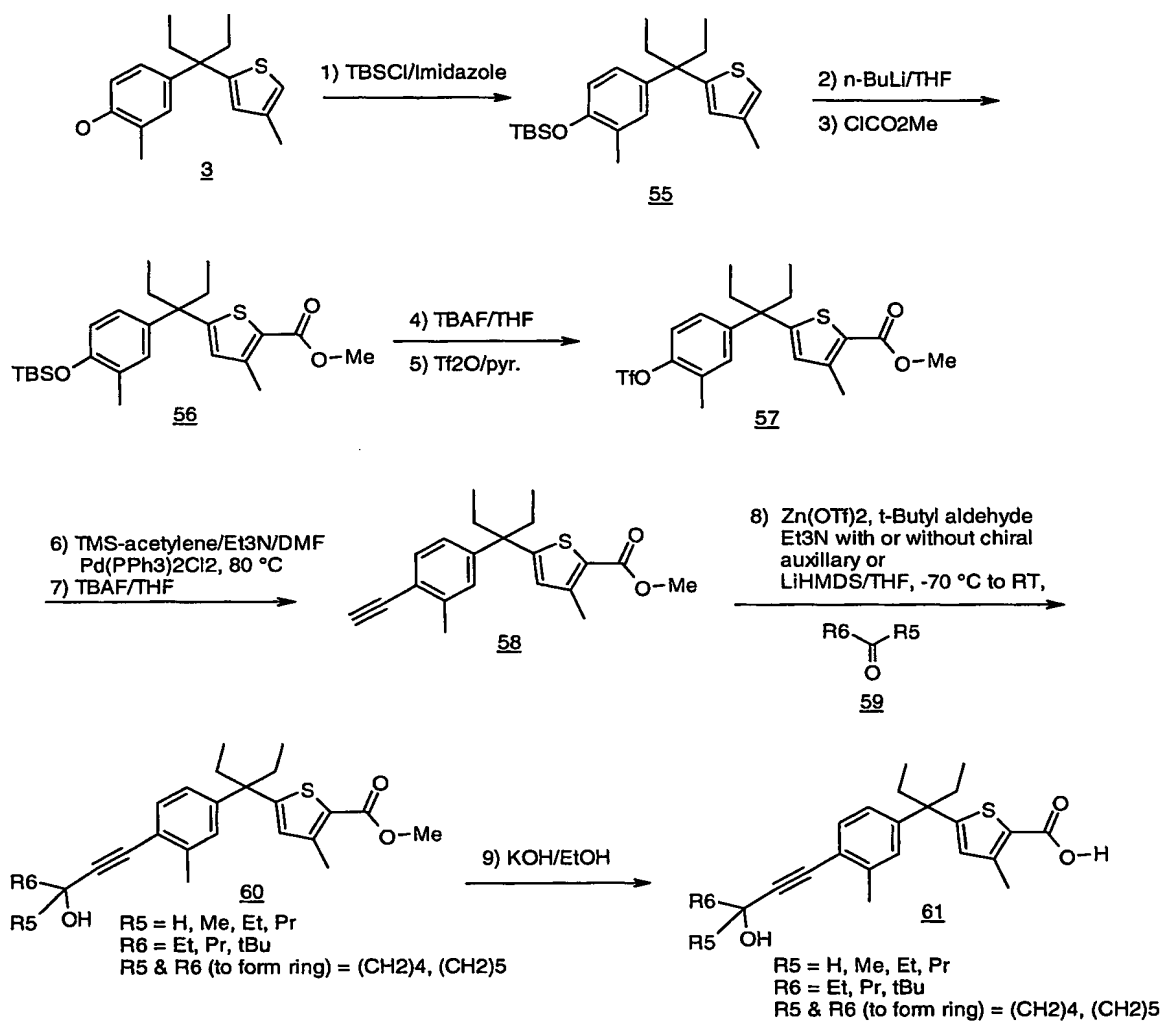
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Scheme 10: Synthesis of Tertiary Alcohol
Phenyl-Thiophene Acids & Amide-Acids



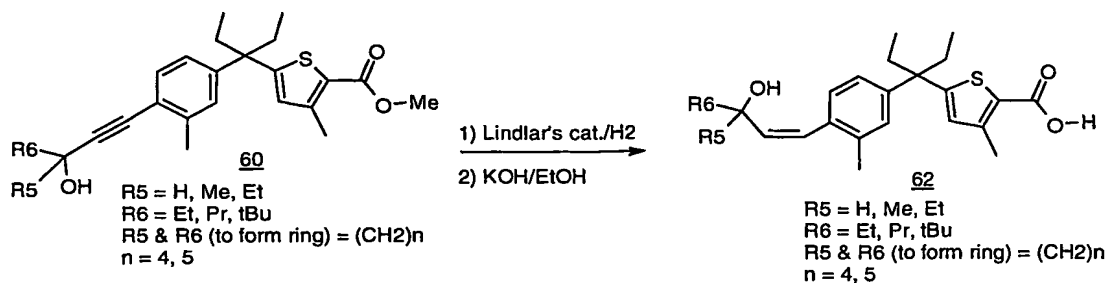
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Scheme 11: Synthesis of Pentynol
Phenyl-Thiophene Acids

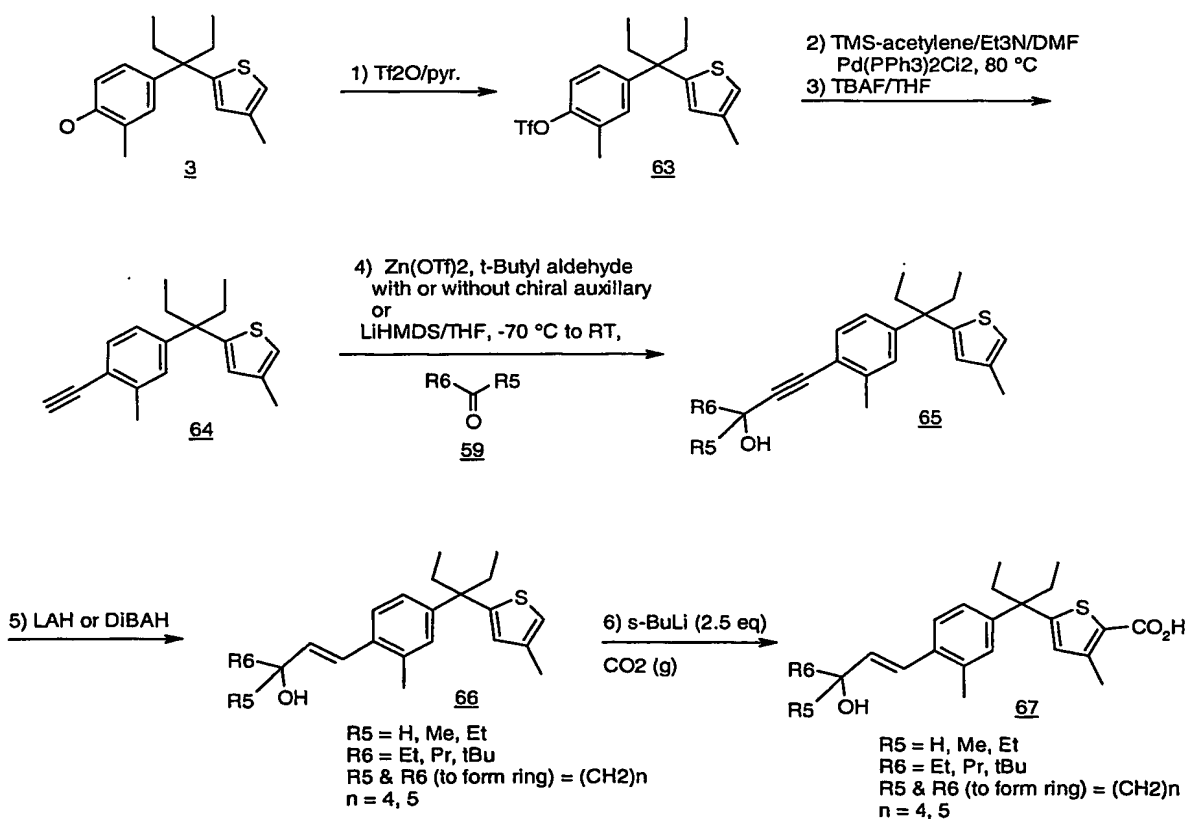


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**Scheme 12: Synthesis of Cis-Pentenol
Phenyl-Thiophene Acids**

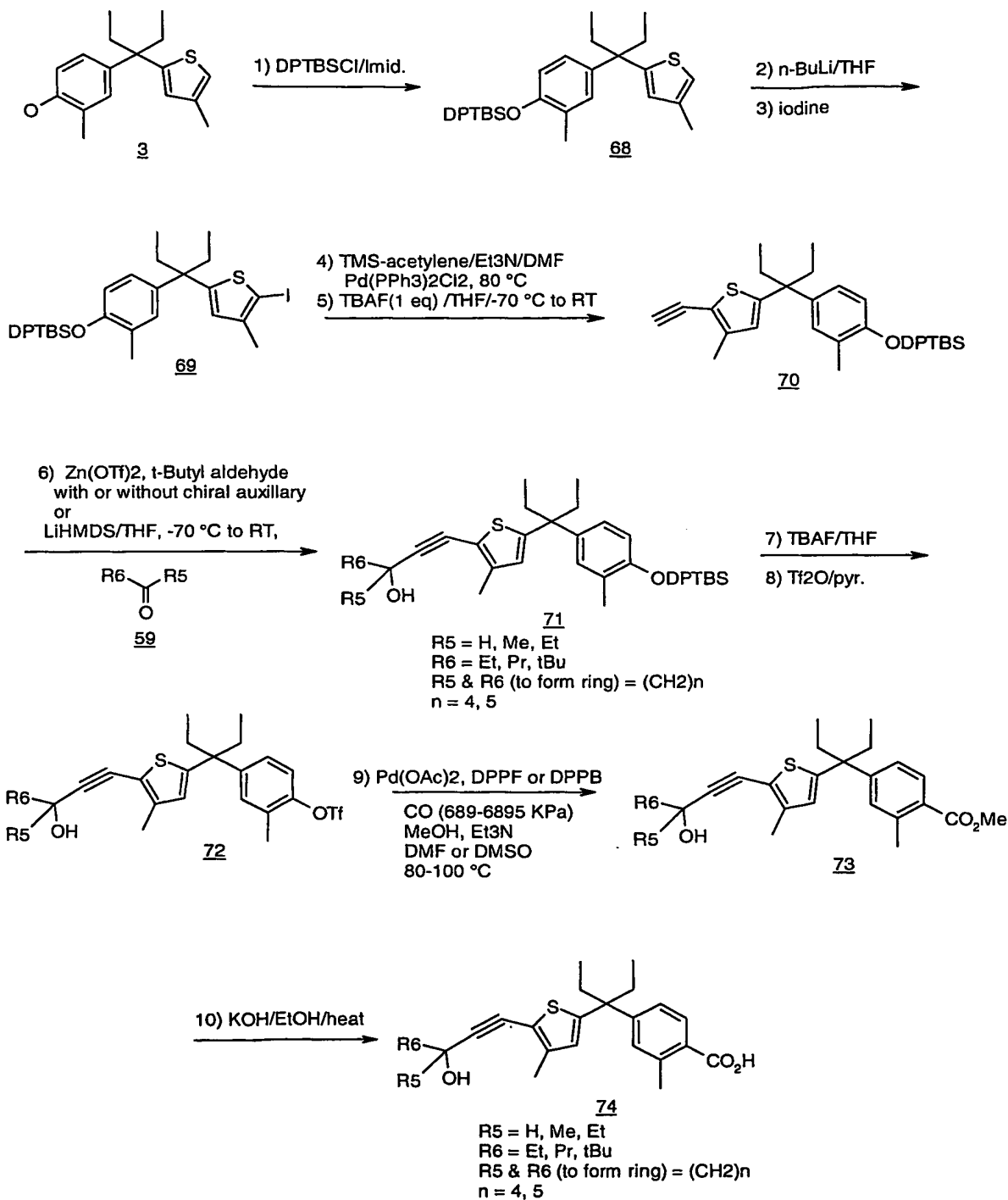


**Scheme 13: Synthesis of Trans-Pentenol
Phenyl-Thiophene Acids**



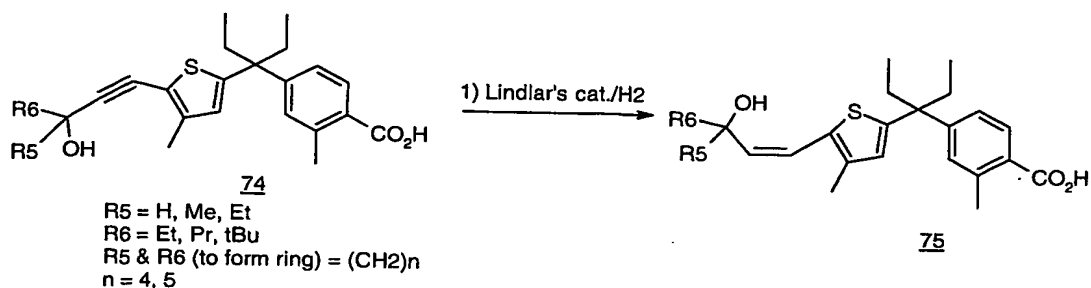
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Scheme 14: Synthesis of Pentynol
Thiophenyl Phenyl Acids

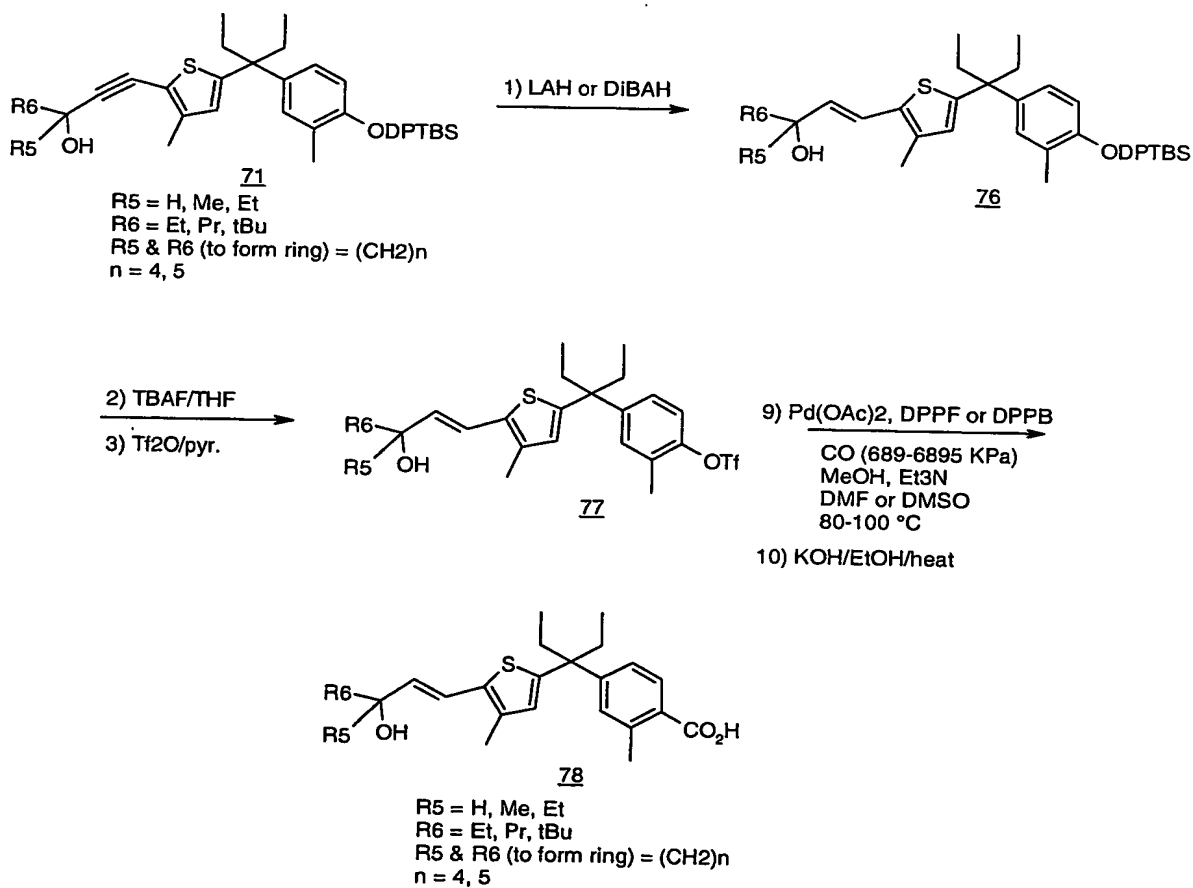


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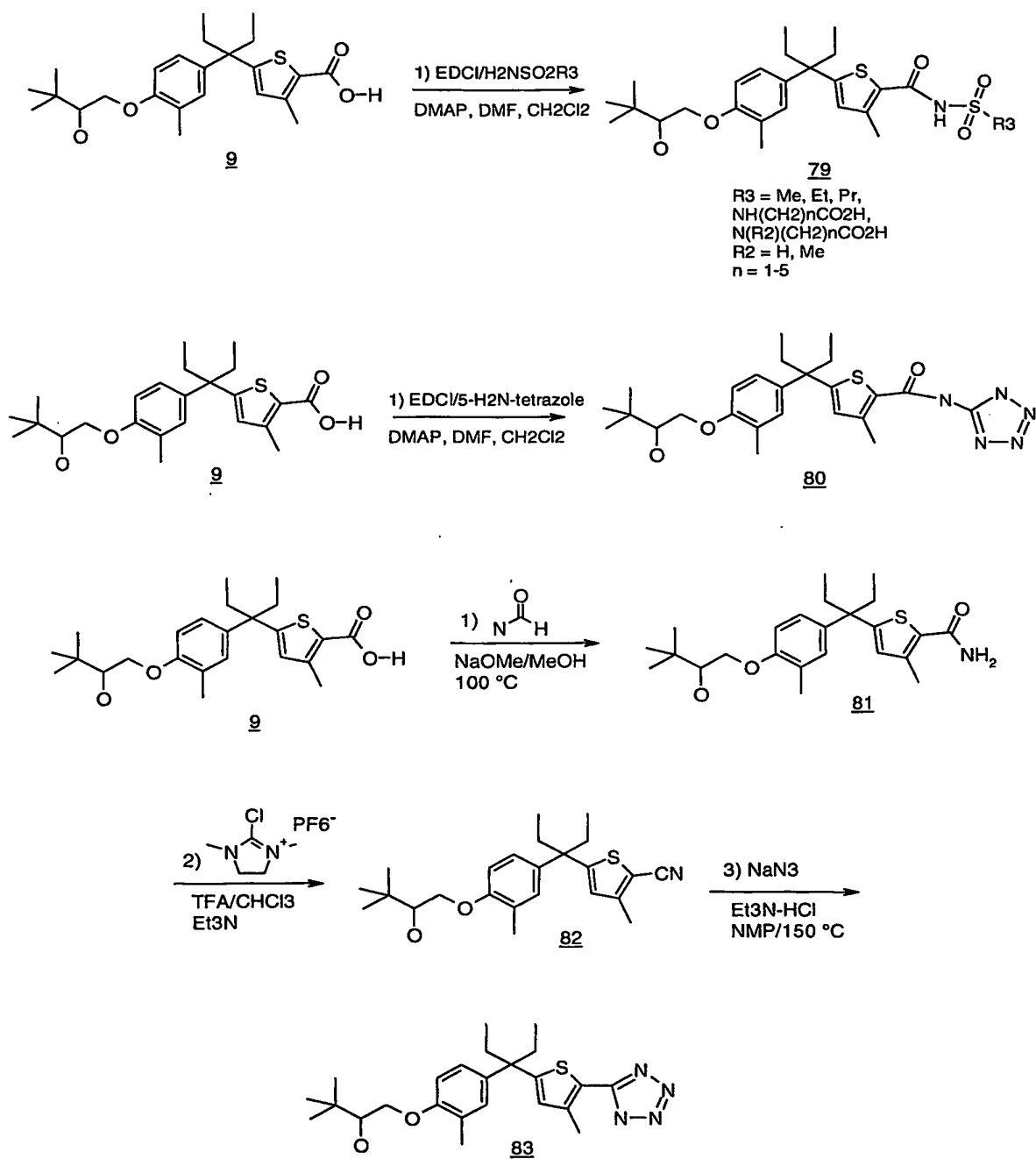
Scheme 15: Synthesis of Cis-Pentenol
Thiophenyl Phenyl Acids



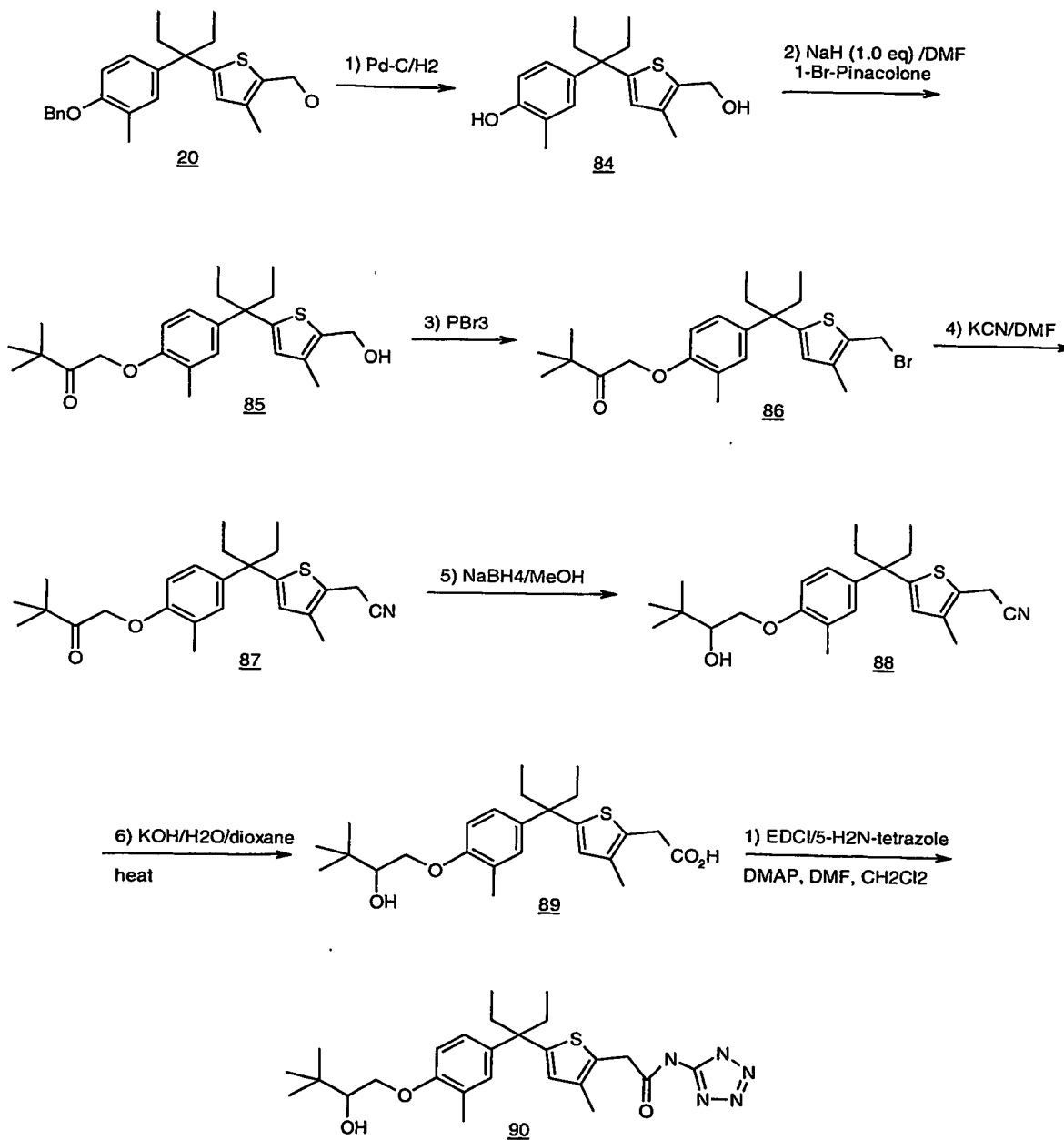
Scheme 16: Synthesis of Trans-Pentenol
Thiophenyl Phenyl Acids



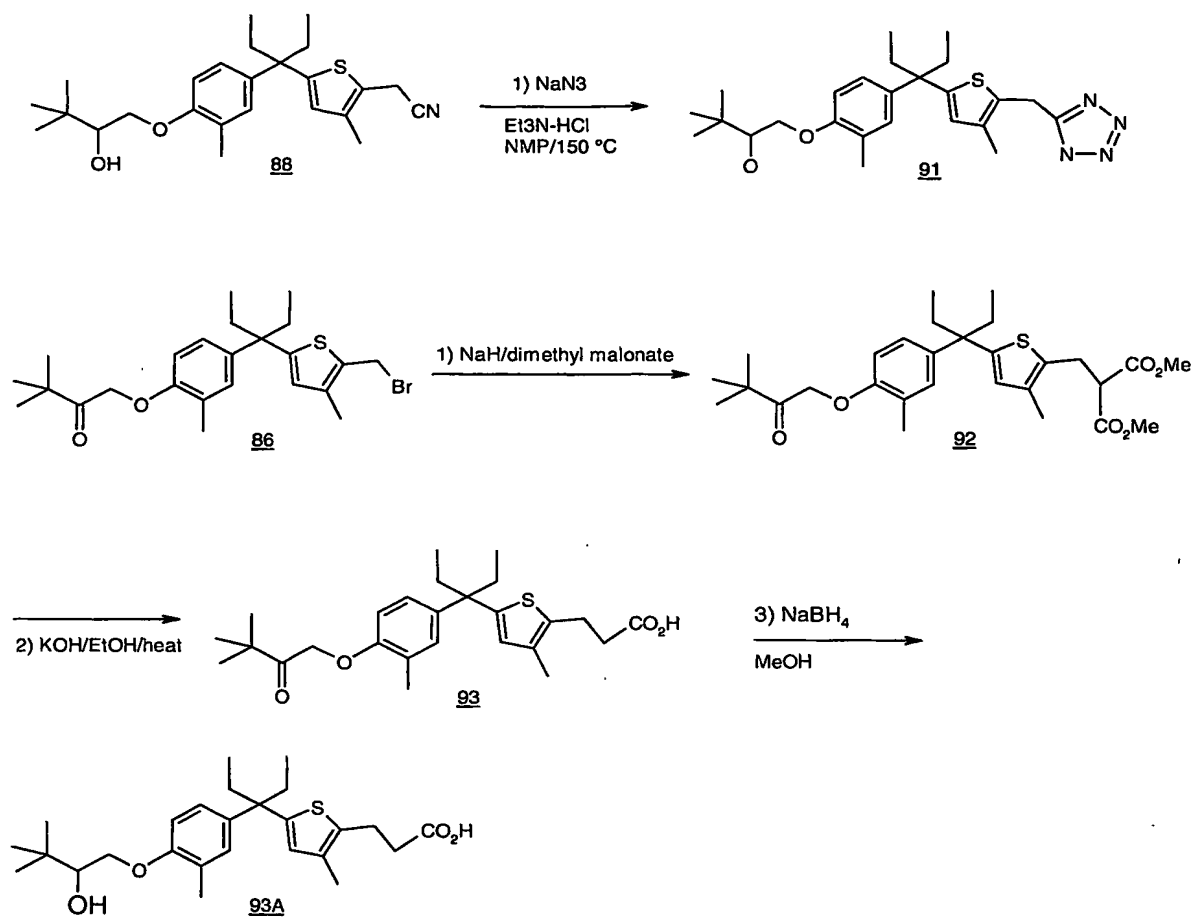
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Scheme 17: Synthesis of Phenyl-Thiophene Acid Mimics

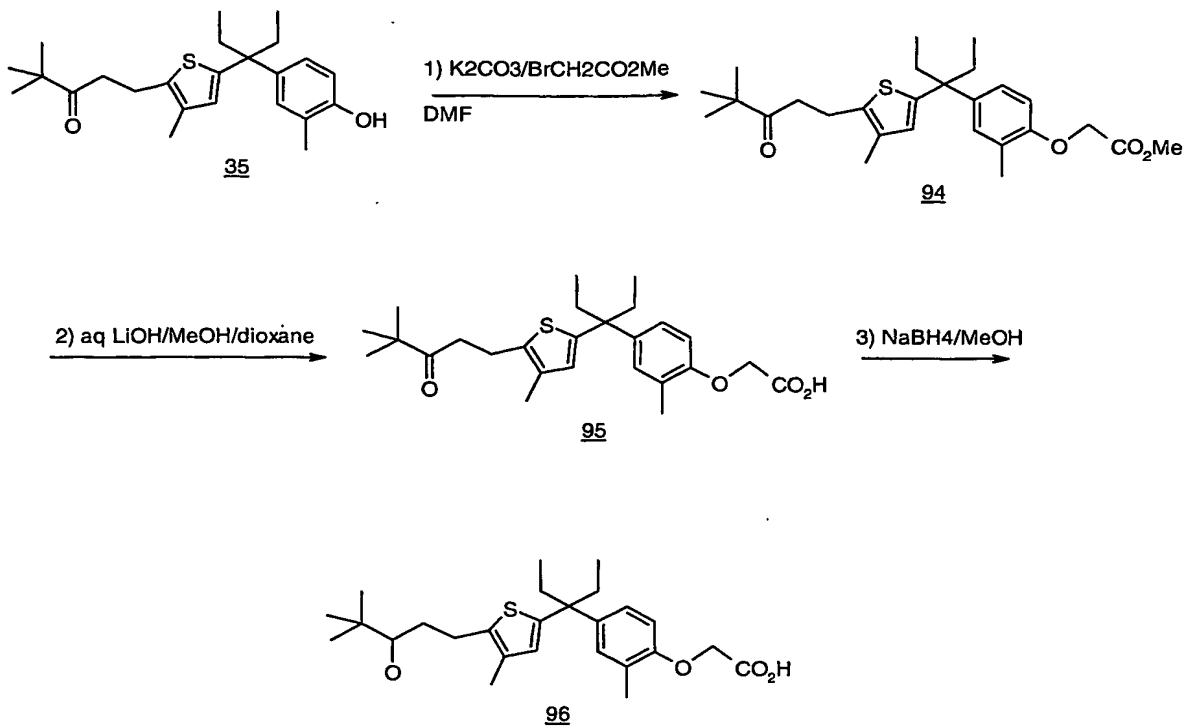
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Scheme 18: Synthesis of Phenyl-Thiophene Acid Analogs

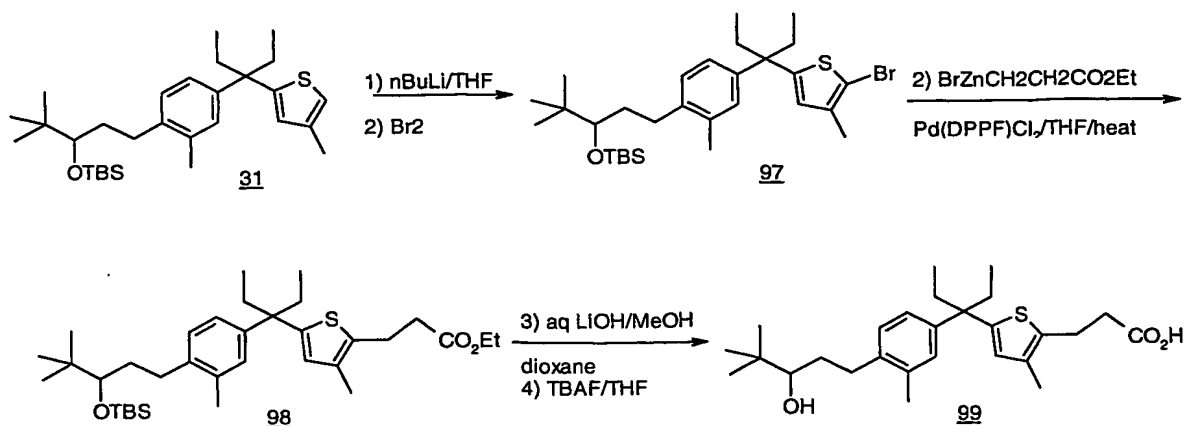
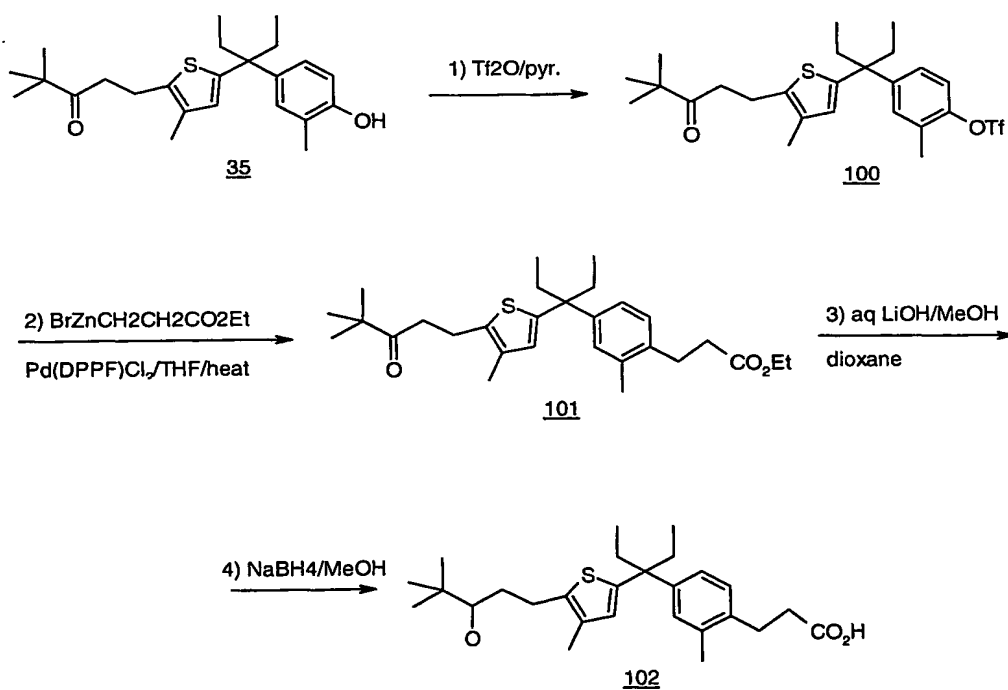
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Scheme 19: Synthesis of Additional Phenyl-Thiophene Acid Analogs

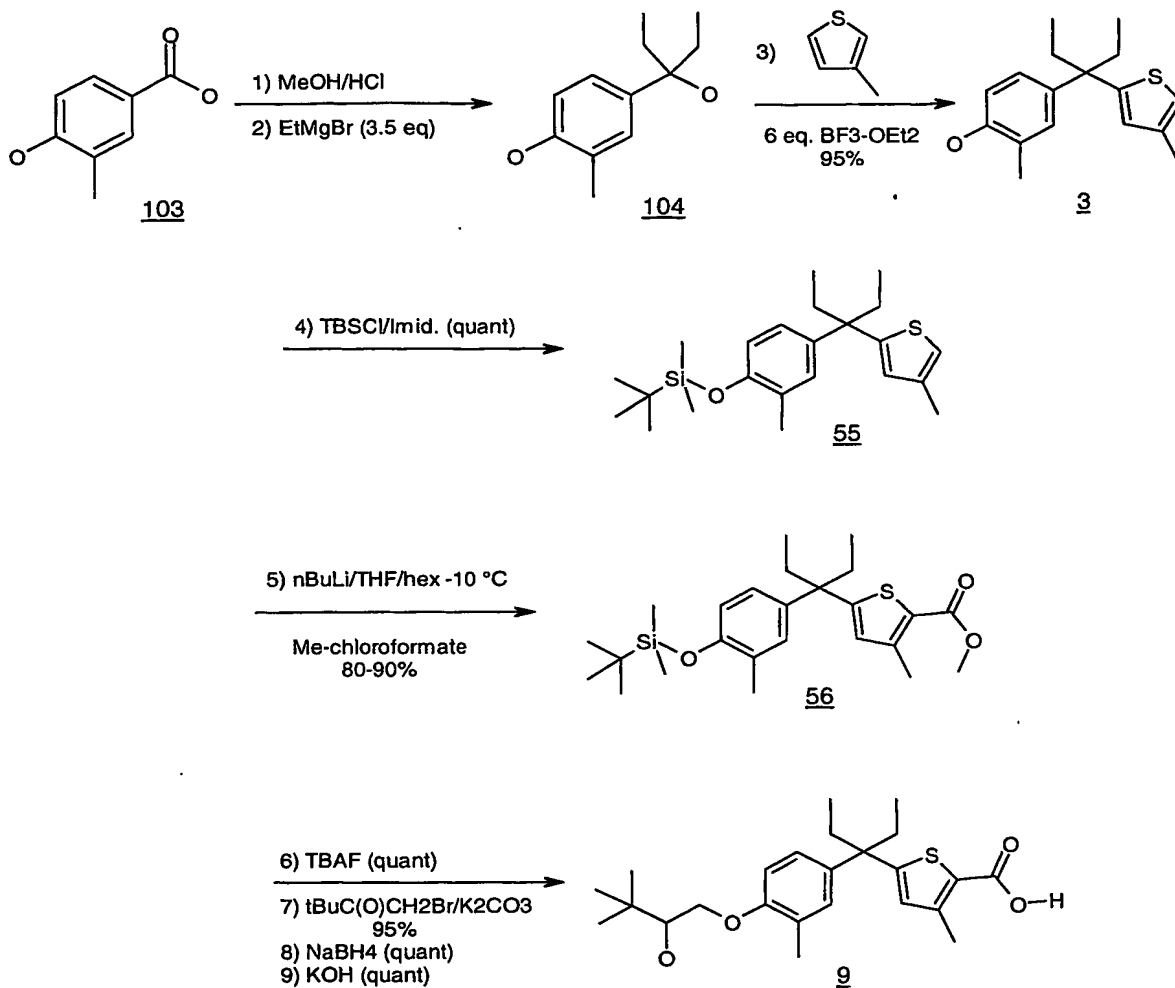
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Scheme 20: Synthesis of Pentan-3-ol Thiophenyl Phenyl Oxyacetic Acid

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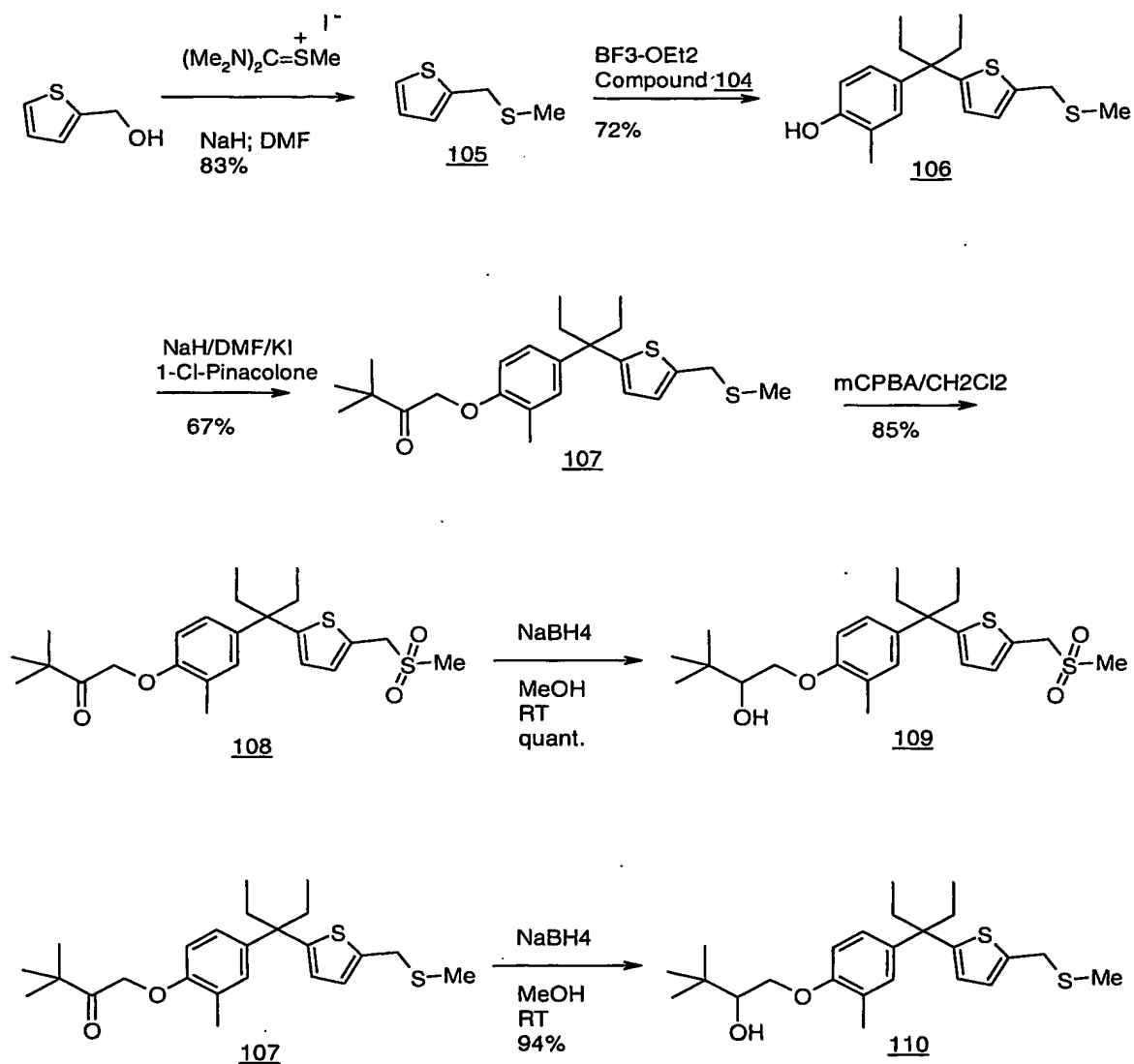
Scheme 21: Synthesis of Pentan-3-ol Phenyl Thiophene Propionic AcidScheme 22: Synthesis of Pentan-3-ol Thiophenyl Phenyl Propionic Acid

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Scheme 23: Improved Synthesis of Phenyl Thiophene Derivatives

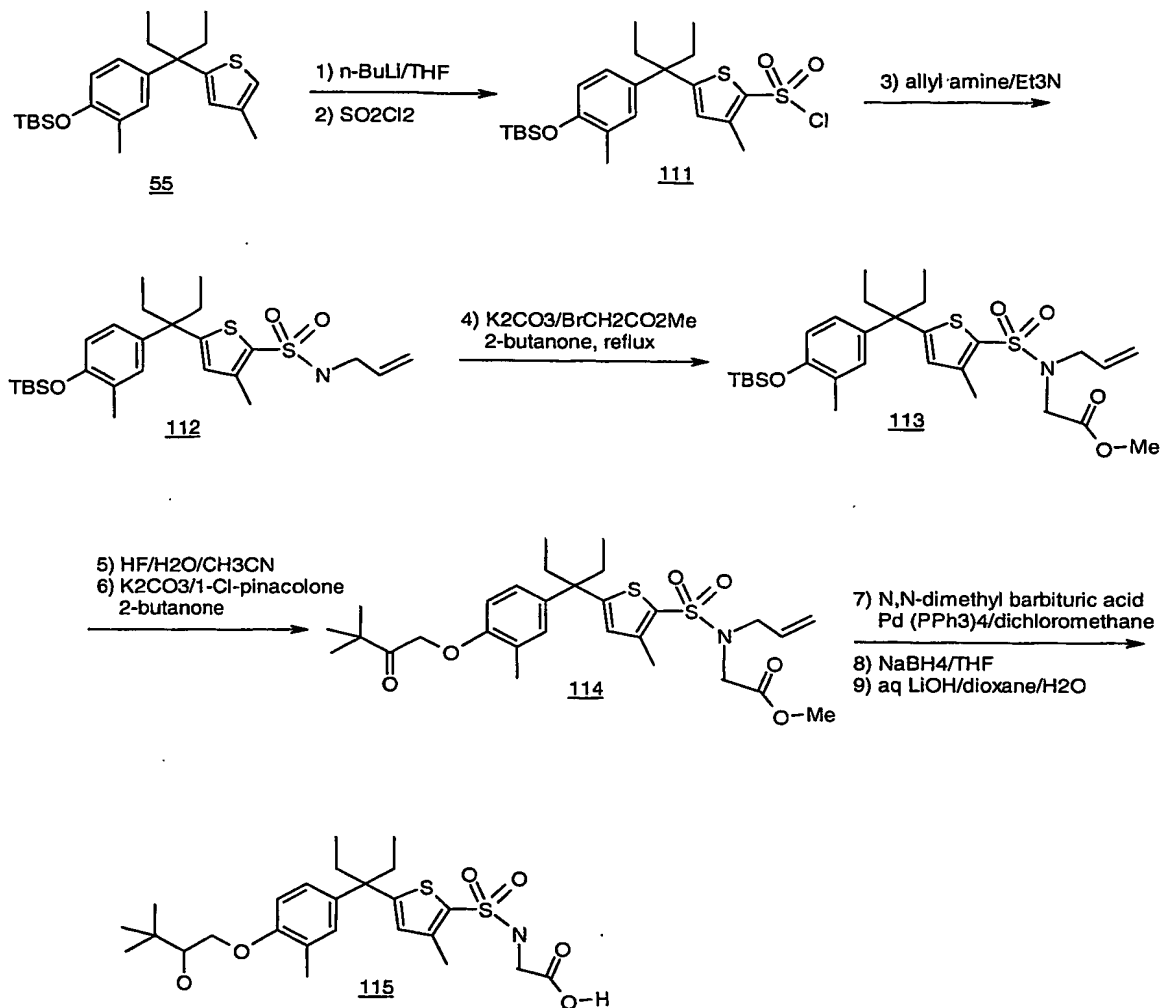
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Scheme 24: Synthesis of Phenyl-3-Unsubstituted
Thiophene Sulfones and Sulfides



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**Scheme 25: Synthesis of Phenyl Thiophene Sulfonamide
and Sulfonamide-Acids**



Experimental Results:

Table 5

Summary of Experimental Results

Test Cmpd. ¹	RXR-VDR (SaOS-2 cells) ² EC ₅₀ (nM)	VDR CTF (Caco-2 cells) ³ EC ₅₀ (nM)	OCN Promoter ⁴ EC ₅₀ (nM)	Mouse Hypercal ⁵ $\mu\text{g/Kg/d}$

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Ex. 1		3696	140.5	
Ex. 2		1112	30.65	>1000
Ex. 3			72.675	3000
Ex. 4		374	147.2	1000
Ex. 5		1027	146.1	>3000
Ex. 6A	81.54	599.84	63.8	1000
Ex. 6B	323.06	1056.5	325.57	>6000
Ex. 7	397.36	274.50	112.35	6000
Ex. 8	956.98		367.2	>3000
Ex. 9	295.3	1091.1	46.65	6000
Ex. 10	58.89	80.71	51.31	
Ex. 11A	18.12	206.61	42.75	1500
Ex. 11B	96.14	365.96	150.15	
Ex. 13	-	-	312.7	-
Ex. 14	85.30	264.11	46.65	
Ex. 15A	40.57	361.28	46.82	>1000

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Ex. 15B	211.66	244.69	19.72	9000
Ex. 16	96.84	866.39	31	>3000
Ex. 18	9.00	551.78	11.16	
Ex. 19A	14.24	310.59	26.2	>3000
Ex. 19B	186.18	450.04	10.2	>1000
Ex. 20			862	
Ex. 21			139.7	
Ex. 24	560.73		4.7	
Ex. 25A	96.27	699.28	9.9	
Ex. 26	74.54	589.16	7.95	1000
Ex. 27			49.1	>3000
Ex. 28		535.75	0.76	
Ex. 29	269.60	790.90	8.65	
Ex. 30A	24.88	573.73	11.22	1000
Ex. 30B	150.40	1046.08	14.1	2000

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Ex. 31	513.63	1919.23	7.8	
Ex. 32	2025.58		9.35	
Ex. 33A	136.16	1697.32	43.55	>9000
Ex. 33B	94.61	778.39	7.55	1000
Ex. 34	735.72	1228.95	96.8	3000
Ex. 35	311.89	1166.83	21.13	3000
Ex. 36	185.38	702.55	67.87	2000
Ex. 37	441.60		239.87	
Ex. 38			379.5	
Ex. 39	189.14		299.66	
Ex. 40	450.82		612.8	
Ex. 41			300.5	
Ex. 42	10.74	1154.56	33.5	
Ex. 43	80.55	598.43	19.7	1000
Ex. 44	584.10	910.97	30.4	1000
Ex. 45	23.76	1671.30	40.95	>1500

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Ex. 46	2.495	855.72	43.6	
Ex. 47	10.047		27.7	
Ex. 48	176.42	949.33	12.3	3000
Ex. 49	526.80	798.80	62.34	>3000
Ex. 50	186.85	1480.00	21.63	>3000
Ex. 51			781	
Ex. 53	821.55		267.2	
Ex. 54	465.43	1436.67	27.5	
Ex. 55	170.75	779.46	29.63	1000
Ex. 56			164.1	
Ex. 57			114.95	
Ex. 58			276.7	
Ex. 59	503	888.71	319	
Ex. 64	173.87	411.13	4.1	
Ex. 65	23.39	497.97	3.4	300

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Ex. 66	313.33	1457.87	28.45	
Ex. 67	202.57	796.53	19.45	3000
Ex. 68	505		56	
Ex. 69	558.83		487.1	
Ex. 70	149.36	1377.99	25.8	
Ex. 71	137.79	497.41	3.5	<300
Ex. 72	498.39	1026.70	218.55	
Ex. 73	670.15		265.8	
Ex. 74	319.27		478.6	
Ex. 75	722.03		423.17	
Ex. 76	552.77		57.8	
Ex. 77	53.70	534.56	2	300
Ex. 81	381.62		200	
Ex. 82	1284			
Ex. 86	321.74		204.6	
Ex. 87	744		>1000	

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Ex. 88	469.50		168.83	
Ex. 89	286.16	360.27	313.67	
Ex. 90	656	1312		
Ex. 91			212	
Ex. 92			75.35	1000
Ex. 93		598.50	38.5	3000
Ex. 94	51.08	599.40	4.05	1000
Ex. 95	420.73	1176.73	21.45	>6000
Ex. 97	16.67	858.15	22.45	3000
Ex. 98	65.30	1019.59	15.85	4000
Ex. 99			38.1	>1000
Ex. 100	53.13	615.07	5.63	3000
Ex. 101	379.25		29.35	12000
Ex. 103	548.21	1284.03	102.35	3000
Ex. 104	286.18	801.07	90.93	1000

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Ex. 105	633.62		735.55	
Ex. 106	83.75	899.38	8.05	≥ 1000
Ex. 107	372.20	1031.12	42.3	
Ex. 108	159.89	352.20	5.25	300
Ex. 110	18.81	113.37	0.225	< 300
Ex. 111	188.97	319.84	34.45	
Ex. 112	485	658	5	
Ex. 113	542		118	
Ex. 114	8.13	85.02	0.28	< 300
Ex. 115	859.39	1109.87	19.95	
Ex. 116	571.99	860.61	16.85	> 3000
Ex. 117	2212.29		101.3	
Ex. 118	384.82		32.25	
Ex. 122	526.60		67.45	
Ex. 123	667.80		474.65	
Ex. 124	453.07		101	

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Ex. 125			144.2	
Ex. 126	2.754	358.01	111.4	
Ex. 127	38.19	1503.75	956	
Ex. 128	433.89	2522.75	12.6	
Ex. 129	390.64		68.4	
Ex. 130	336.51	1105.33	49.7	
Ex. 131	461.51	693.30	59.35	3000
Ex. 132	355.90	969.29	51.25	1000
Ex. 133	603.09	957.74	49.25	>9000
Ex. 134	4.05	1302.99	30.6	
Ex. 135	318.10	620.06	29.9	
Ex. 136	430.68	901.03	145.8	
Ex. 137	409.00		24.2	>3000
Ex. 138	476.09	1060.24	27.13	2000
Ex. 139	479.30		30.97	>3000

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Ex. 140	436.81		72.45	
Ex. 141	196.86		43.7	
Ex. 142 2123818	604.77	783.08	113.7	3000
Ex. 143	735.29		687.93	
Ex. 144	687.94	1513.74	29.2	3000
Ex. 145	284.27		221.8	
Ex. 146	676.02		27.7	>3000
Ex. 147	351.94		128.27	
Ex. 148	848.32	1146.189	236.2	
Ex. 149	371.94	1206.25	98.35	
Ex. 150	103.99	1128.4	55.2	
Ex. 151	257.44	714.98	48.2	>3000
Ex. 152	473.97		110	
Ex. 153	376.02		187	
Ex. 154	171.33	470.46	20.5	
Ex. 155	270.66	799.30	18.4	6000

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Ex. 157	235.83	484.31	7.65	>1000
Ex. 158	732.37	2414.37	84.97	
Ex. 159	400.62	1336.75	89.67	
Ex. 160	900.63		40.3	3000
Ex. 161			77	
Ex. 162			131	
Ex. 163	649.14		105.9	
Ex. 164	1054.86		150.4	
Ex. 165	1783.20		137.7	
Ex. 166	1072.82		151	
Ex. 169	80.70	370.91	17.65	<1000
Ex. 170	96.53	589.04	8.4	1000
Ex. 171	229.78	930.62	92.6	
Ex. 172	417.83	781.88	17.2	
Ex. 173	80.93	645.18	25.4	3000

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Ex. 174	58.90	1100.63	172	
Ex. 175	687.78		126.9	
Ex. 176	135.98	288.78	174.2	
Ex. 177	362.21		45.97	
Ex. 178			25.5	
Ex. 179	142.50	279.42	27.85	
Ex. 180	394.35	603.53	40.52	>3000
Ex. 181	403.35	645.03	83.57	>3000
Ex. 182			231.3	
Ex. 183	134.13	781.17	38.6	
AA	5.02	16	5	0.06
BB	10.32	169.81	8.24	>=20
CC	2427.7		>1000	
DD	109.44		31.1	1000
EE	429.99	891.16	34`1.25	1000
FF	3	57		

Table 6

Summary of Experimental Results

Test Cmpd. ¹	Kera. Prolif. IC ₅₀ (nM)	IL-10 IC ₅₀ (nM)
Ex. 1		
Ex. 2		
Ex. 3		
Ex. 4	122.5	
Ex. 5		
Ex. 6A	439.0	
Ex. 9	129	98
Ex. 10	25.0	
Ex. 11A		
Ex. 11B	216.0	
Ex. 15A	76	26
Ex. 15B	84.0	66
Ex. 16	257.0	
Ex. 18	24.5	
Ex. 19A	18	60
Ex. 19B	20	48
Ex. 29	4.6	
Ex. 30A	13.0	
Ex. 30B	40	120
Ex. 33B	22.5	

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Ex. 35	474.0	
Ex. 39	367.0	
Ex. 48	71.5	
Ex. 49	430.0	
Ex. 55	0.1	
Ex. 65	56	41
Ex. 66	277.0	
Ex. 67	197.0	
Ex. 71	29.0	
Ex. 77	194.0	
Ex. 89	105.0	
Ex. 93	178.0	
Ex. 100	215.0	
Ex. 106	13.0	
Ex. 108	66.0	597
Ex. 110	9.5	288
Ex. 124	216.3	
Ex. 138	102.0	110
Ex. 142	300.0	
Ex. 145	702.0	
Ex. 155	788.0	
Ex. 158	500.0	
Ex. 159	234.3	
Ex. 160	1095.0	
Ex. 169	522.0	
Ex. 170	36	100
Ex. 173	478.0	
Ex. 176	114.0	

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Ex. 177	81.3	
Ex. 179	221.0	
AA	120	1.2
BB	10	28
CC	-	-
DD	1060	
EE		
FF	103	0.5

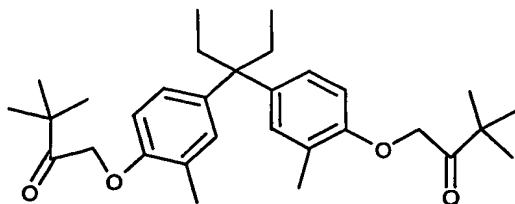
Explanation of Table 5 and 6 column numerical superscripts:

1. Test Compound numbers refer to the products of the corresponding Example Nos. that is, compounds within the scope of the invention. For example, the number "Ex. 2" refers to the compound, 3'-[4-(2-hydroxy-3,3-dimethylbutoxy)-3-methylphenyl]-3'-[5-methoxycarbonyl-4-methylthiophen-2-yl]pentane, prepared in Example 2. The control experiments are done with the double letter coded compounds identified as follows:

"AA" = 1 α ,25-dihydroxyvitamin D₃

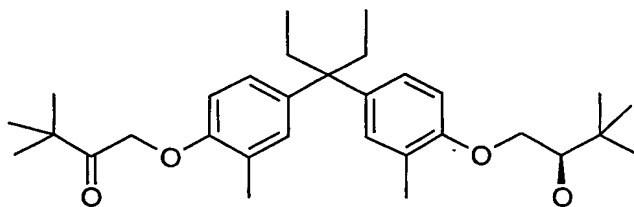
"BB" = 3-(4-{1-Ethyl-1-[4-(2-hydroxy-3,3-dimethyl-butoxy)-3-methyl-phenyl]-propyl}-2-methyl-phenoxy)-propane-1,2-diol "CC" = 1-(4-{1-[4-(3,3-Dimethyl-2-oxo-butoxy)-3-methyl-phenyl]-cyclohexyl}-2-methyl-phenoxy)-3,3-dimethyl-butan-2-one

"DD" = compound represented by the formula:

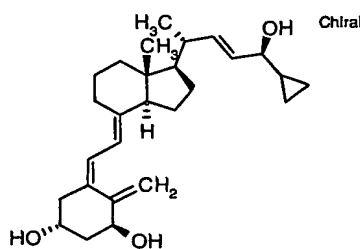


"EE" = compound represented by the formula:

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calcipotriol (structural formula below):



2. The RXR-VDR heterodimerization (SaOS-2 cells) test is described in the “Assay” section of the Description, *infra*.

3. The VDR CTF (Caco-2 cells) test is described in the “Assay” section of the Description, *infra*.

4. The OCN Promoter test is described in the “Assay” section of the Description, *infra*.

5. The Mouse Hypercalcemia test is described in the “Assay” section of the Description, *infra*.

6. The keratinocyte proliferation assay is described in the “Assay” section of the Description, *infra*.

7. The IL-10 induction assay is described in the “Assay” section of the Description, *infra*.

Assay Methods

Use of the Assay Methods:

The evaluation of the novel compounds for use in the method of treating or preventing visicant damage is done using a plurality of test results. The use of multiple assays is necessary since the combined properties of (i) high activity for the vitamin D receptor, and (ii) prevention of hypercalcemia must be achieved to have utility for the methods of treating diseases, which are also, aspects of this invention. Some of the tests

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described below are believed related to other tests and measure related properties of compounds. Consequently, a compound may be considered to have utility in the practice of the invention if it meets most, if not all, of the acceptance criteria for the above described tests.

5 The evaluation of the novel compounds of the invention for psoriasis is done using the Keratinocyte Proliferation Assay in combination with other assays that measure inhibition of IL-2 production and stimulation of IL-10 production in peripheral blood mononuclear cells (PBMCs).

Brief Description, Utility and Acceptance Criteria for the Assay Methods:

10 1. The RXR-VDR heterodimer Assay:

 This assay provides the VDR activity of a test compound. It is desirable to have low EC50 values for a compound in this assay. The lower the EC50 value, the more active the compound will be as a VDR agonist. Desired assay results
15 are EC50 values less than or equal to 600 nM. Preferred assay results are less than 250 nM, and most preferably less than 150 nM.

2. The Caco-2 cell Co-transfection Assay:

 The Caco-2 cell assay is an indicator for the undesirable condition of
20 hypercalcemia. This co-transfection assay is a surrogate assay for in vivo calcemic activity of VDR ligands. It is desirable to have high EC50 values for a test compound in this assay. The higher the EC50 values for a compound the less calcemic it will be in vivo. Desired assay results are EC50 greater than or equal to 300 nM. Preferred assay results are greater than 1000 nM.

25 3. The OCN (osteocalcin) Promoter Assay

 The OCN Promoter Assay is an indicator and marker for osteoporosis. Desired assay results are EC50 less than or equal to 325 nM. Preferred assay results are less than 50 nM.

30 4. The Mouse Hypercalcemia Assay

The Mouse Hypercalcemia Assay is a six day hypercalcemia test for toxicity and selectivity. Acceptable test results are levels greater than 300 µg/kg/day. Preferred assay results are levels greater than 1000 µg/kg/day.

5 5. The Keratinocyte Proliferation Assay

This Assay is indicative for the treatment of psoriasis. An acceptable test result is IC₅₀ value of less than or equal to 300 nM. Preferred assay results are IC₅₀ values of less than 100 nM.

10 6. The IL-10 induction Assay

This is an in vitro efficacy assay for psoriasis, abscess and adhesion. Psoriasis involves both keratinocytes and immune cells. IL-10 is a unique cytokine because it is anti-inflammatory and immunosuppressive. This assay tells us whether a VDRM is able to function as an agonist in PBMCs (primary blood mononuclear cells) or not. A lower EC₅₀ value is desirable in this assay since a compound with a lower EC₅₀ value will be a better agonist in PBMCs. An acceptable test result is an EC₅₀ value of less than 200 nM. Preferred assay results are EC₅₀ values of less than 100 nM.

Details of the Assay Methods:

20 (1) Materials and Method for RXR-VDR Heterodimerization Assay:

Transfection Method:

- *FuGENE 6 Transfection Reagent* (Roche Cat # 1 814 443)

Growth Media:

- D-MEM High Glucose (Gibco BRL Cat # 11054-020), 10% FBS, 1% antibiotic-antimycotic (Ab-Am)

FBS heat inactivated (Gibco BRL Cat # 10092-147)

Ab-Am (Gibco BRL Cat # 15240-062)

Cells:

- Grow SaOs-2 cells in T-152 cm² culture flasks in *growth media*.
- 30 • Keep the density at 5-6 x 10⁵ cells/ml
- Passage cells 1:3 twice a week
- Add Trypsin EDTA (Gibco BRL Cat # 25300-020) and incubate

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- Resuspend cells in plating media and transfer into growth media.

Wash Media:

- HBSS Low Glucose Without Phenol Red (Gibco BRL Cat # 14175-095), 1% Ab-Am

Plating Media:

- 5 • D-MEM Low Glucose Without Phenol Red (Gibco BRL Cat # 11054-020), 1% Ab-Am
D-MEM

Stripped FBS (Hyclone Cat# SH30068.03 Lot # AHM9371)

Ab-Am

Transfection / Treatment Media:

- 10 • D-MEM Low Glucose Without Phenol Red only

T-152 cm² culture flask:

- Use Corning Coastr T-152 cm² culture flask (Cat # 430825) to grow the cells

Flat well Plates:

- Use well plate to plate cells

- 15 • Use Deep well plate sterile to make up treatment media.

Luciferase Assay Reagent:

- Use Steady-Glo Luciferase Reagent from Promega (Cat # E2550) Consists of:

a. E2533 Assay Substrate, lyophilized product and

- 20 b. E2543 Assay Buffer.

- Thaw at room temperature

- Store

DAY 1: Cell Plating:

Cell Harvesting

- 25 Aspirate media from culture flask, rinse cells with HBSS and aspirate.

Add trypsin and incubate.

When cells appear detached, resuspend cells in *growth media*.

Transfer into a new flask with fresh *growth media* for passaging the cells.

Plate well plates and two extra plates

- 30 B. Cell Count

Mix the cell suspension using pipette

Use *Hematocytometer* to count the cells

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Load cell suspension onto the hemocytometer chamber

Count cells.

Plate seeding:

Use plating media 10 % Stripped FBS in D-MEM Low Glucose, Without Phenol Red, 1%

5 Ab-Am

Plate 14 plates @ 165 μ l / well.

In sterile flask add cell suspension
to *plating media*.

Mix .

10 Add cells / well.

Place the cells in the incubator.

Cells should be about 75 % confluent prior to transfection.

DAY 2: Transfection

15 Step 1: DNA and Media

Add plain DMEM media to tubes for mixing the DNA

Add the Reporter gene pFR-LUC

Add the Gal4-RXR-DEF and VP16-VDR-LBD

20 Step 2: FuGENE and Media

Prepare plain DMEM media in a tubes for mixing FuGENE

Add *FuGENE 6 Transfection Reagent*

Incubate

25 Step 3: FuGENE , DNA and Media Complex

Add FuGENE Media complex from step 2 to DNA Media complex from step1

Incubate

Step 4: FuGENE , DNA and Media Complex to-well plate

30 Add FuGENE-DNA-Media complex from step 3 to each plate

Incubate.

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DAY 3: Dosing*Treatment preparation*

Allow for transfection time

- 5 Make a stock solution of the compounds in DMSO
Vortex until all the compounds has been dissolved.
Further dilute in D-MEM (Low Glucose – With out Phenol Red)
Add compounds in quadruplicate to give final volume
Incubate.
- 10 Day 4: Luciferase Assay
Read the plates after drug treatment
Remove part of media from all the wells and leave remainder
Add Steady-Glo Luciferase Reagent mixture / wells
Incubate
- 15 Count each well using a Luminescence counter, Top Count NXT by Packard
Set a delay between plates to reduce the background.

(2) Materials and Method for The Caco-2 Cell Assay:

- 20 Caco-2 cells, grown in phenol red free, DMEM (Invitrogen, Carlsbad, CA)
containing 10 % charcoal-stripped FCS (Hyclone, Logan, UT), were transfected
with Fugene 6 reagent (Roche Diagnostics, Indianapolis, IN). Cells (5000/well)
were plated 18 h before transfection in a 96 well plate. The Cells were transfected
with Gal4-responsive reporter pFRLuc (150 ng, Stratagene, La Jolla CA) and the
receptor expression vector pGal4-VDR-LBD (10 ng), along with Fugene 6
25 reagent (0.2 μ l/well). The DNA-Fugene complex was formed by incubating the
mixture for 30 min at room temperature. The cells were transfected in triplicate
for 5 h, and treated with various concentrations of VDR ligands (form 0.01 nM to
10,000 nM concentration range) 18h post-transfection. The luciferase activity
was quantified using Steady-Glo reagent kit (Promega, Madison, WI) as per
30 manufacturer's specifications.

(3) Materials and Method for The OCN Promoter Assay:

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The activation of osteocalcin by VDR ligands was evaluated in a rat osteoblast-like cell line RG-15 (ROS 17/2.8) stably expressing rat osteocalcin promoter fused with luciferase reporter gene. The stable cell lines were established as reported before (Activation of Osteocalcin Transcription involves interaction of protein kinase A- and Protein kinase C-dependent pathways.

Boguslawski, G., Hale, L. V., Yu, X.-P., Miles, R. R., Onyia, J. E., Santerre R. F., Chandrasekhar, S. J Biol. Chem. 275, 999-1006, 2000). Confluent RG-15 cells maintained in DMEM/F-12 medium (3:1) containing 5% FBS, 300 μ g/ml G418 and at 37°C under 5% CO₂/95% air atmosphere were trypsinized (0.25% trypsin) and plated into white opaque 96-well cell culture plates (25000 cells/well). After 24 hr, cells (in DMEM/F-12 medium + 2% FBS) were treated with various concentrations of compounds, dissolved in DMSO. The final DMSO concentration remained at 0.01% (v/v). After 48 hr treatment, the medium was removed, cells were lysed with 50 μ l of lysis buffer (From Luciferase reporter assay system, Roche Diagnostics, Indianapolis, IN) and assayed for luciferase activity using the Luciferase Reporter Gene Assay kit from Boehringer Mannheim as per manufacturer's specifications.

(4) Materials and Method for The Mouse Hypercalcemia Assay:

Weanling, virus -antibody-free, five to six weeks old female DBF mice (Harlan, Indianapolis, IN) are used for all the studies. Animals are allowed to acclimate to local vivarium conditions for 2 days. Mice are maintained on a 12 hr light/dark cycle at 22°C with ad lib access to food (TD 5001 with 1.2% Ca and 0.9%P, Teklad, Madison, WI) and water. The animals then are divided into groups with 4-5 mice per group. Different doses of test compounds prepared in 10% Ethanol and 90% sesame oil are administered to mice orally via gavage for 6 days. 1 α -25(OH)₂D₃ 0.5 μ g/kg/d was also given to one group of mice as the positive control. Serum ionized calcium is evaluated at 6 hours after the last dosing under isoflurane anesthesia by Ciba-Corning Ca⁺⁺/PH Analyzer, (Model 634, Chiron Diagnostics Corp., East Walpole, MA). Raw data of group differences is assessed by analysis of variance (ANOVA) using Fisher's protected least significant difference (PLSD) where the significance level was P< 0.05.

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(5) The Keratinocyte Proliferation Assay:

KERtr cells (Human skin keratinocyte transformed with a retrovirus vector, obtained from ATCC) were plated in 96-well flat-bottomed plates (3000 cells/well) in 100 μ l keratinocyte serum free medium supplemented with bovine pituitary extract in the absence of EGF (Life Technologies, Rockville, MD) and incubated at 37°C for two days. The cells were treated with various concentrations of VDR ligands (ten-fold serial dilution from 10,000 nM to 0.1 nM in triplicate), dissolved in 100 μ l keratinocyte serum free medium supplemented with bovine pituitary extract in the absence of EGF and incubated at 37°C for 72hr. BrdU (5-bromo-2'-deoxyuridine) incorporation was analyzed as a measure of DNA replication (Cell proliferation ELISA kit, Roche Diagnostics, Indianapolis, IN) and absorbance was measured at 405 nm. Potency values (IC₅₀) values were determined as the concentration (nM) of compound that elicited a half-maximal response.

(6) Materials and Method for human IL-10 Induction Assay:

Isolation of peripheral blood mononuclear cells (PBMCs):

A. Collect 50 ml of human blood and dilute with media, RPMI-1640.

B. Prepare sterile tubes with ficol.

C. Add diluted blood to tubes.

D. Centrifuge.

E. Discard the top layer and collect the cells from middle layer.

F. Divide all cells into four tubes and add media.

G. Centrifuge.

H. Aspirate off media and resuspend.

I. Collect all cells

J. Centrifuge. at 1200 rpm for 10 minutes.

K. Resuspend in RPMI-1640 with 2% FBS and count cells

Stimulation of PBMC:

L. Prepare TPA in DMSO.

M. Dissolve PHA in water .

N. Plate TPA/PHA treated PBMCs in well plates.

O. Incubate.

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Treatment:

P. Prepare all compound dilutions in plain RPMI- 1640 media.

Q. Add diluted compound.

R. Incubate.

5 **Sample Collection and assay:**

S. Remove all the cells by centrifugation and assay the supernatant for IL-10 by immunoassay.

1) T. Perform IL-10 assay using anti-human IL-10 antibody coated beads, as described by the manufacturer (Linco Research Inc., St. Charles, MO).

10